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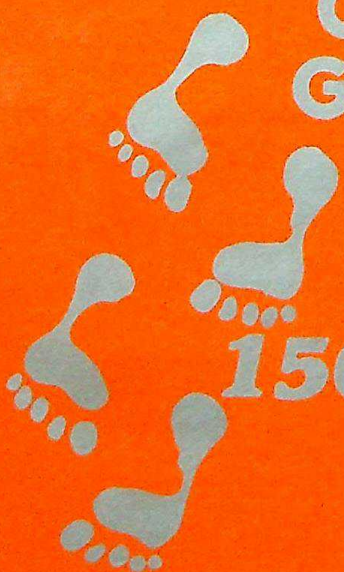

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SETTLEMENT HISTORY
AND
RISE OF CIVILIZATION IN GANGA-YAMUNA DOAB

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Settlement History and Rise of Civilization in Ganga-Yamuna Doab

(from 1500 B.C. to 300 A.D.)

MAKKHAN LAL

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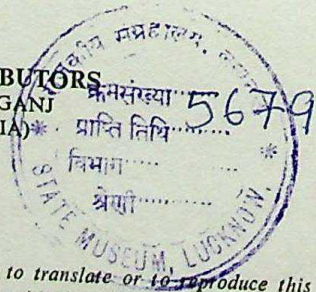

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To

My Uncle

Late Shri Nawal Kishor Srivastava

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We do not know : we can only guess. And our guesses are guided by the unscientific, the metaphysical (though biologically explicable) faith in laws, in regularities which we may uncover-discover.

Karl R. Popper
The Logic of Scientific Discovery
(1980, p. 278)

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Foreword

Ever since the discoveries made at Harappa and Mohenjo-daro in the 1920s, books have been written highlighting the achievements of the Indus Valley Civilization. However, no such book could possibly have been thought of in respect of the Ganga Valley prior to 1951-52 when the excavations at Hastinapura in Meerut District, Uttar Pradesh, brought to light for the first time a culture-sequence taking the story back to the middle of the second millennium B.C. At the same time, it may be stated that Hastinapura produced only a skeletal frame-work to which flesh and blood still remained to be added. This was done by the subsequent excavations at various sites, such at Atranji Khera, Alamgirpur, Hulas, Kausambi, Mathura, Rajghat, Saipai, etc. While the excavations at Alamgirpur and Hulas have clearly shown that the Indus Valley Civilization did penetrate into the upper Ganga-Yamuna *doab*, the excavations at Saipai have demonstrated that the previously 'floating, Copper Hoards could really be brought down to the *terra firma* and affixed to the Ochre Colour Ware Culture, datable broadly to the second millennium B.C. Atranjikhera has amply enlarged the picture of the Painted Grey Ware Culture. Rajghat has given a good account of the Black-slipped Ware material, while Kausambi will remain as a very important site for the Northern Black Polished Ware period.

With all these discoveries what had become necessary was to produce a synthesis, which the present book by Dr. Makkhan Lal does in ample measure, though its main concentration is on an in-depth study of a limited area, namely that of Kanpur District.

The book is characterized by an analytical exposition of several debated issues. For example, it makes a very good study of the problem whether the Ochre Colour Ware Culture is related to the Harappa Culture or not. I think Dr. Makkhan Lal is right when he says that though there is evidence at certain sites in the upper Ganga-Yamuna *doab* of an intermingling of the two cultures, there is little at sites further down the *doab* to show that the OCW Culture is derivable from the Harappa Culture. Further, the typology as well as technology of the Copper Hoards themselves militate against such a view.

The dating of the Painted Grey Ware Culture has also become an issue of great debate. Some would even like us to believe that the PGW Culture

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continued up to the Mauryan times. Dr. Makkhan Lal has collected the entire evidence, both stratigraphical as well as that yielded 14C dates, and has very satisfactorily demonstrated that, taking into account its overall geographic range, the PGW Culture may well have commenced before the close of the second millennium B.C., and that it did not persist in any case after the middle of the first millennium B.C., not to speak of its having continued into the third century B.C.

However, it is Part III of the book that gives an altogether new dimension to the study of the various cultures of the *doab*, taking Kanpur District as an example. Dr. Makkhan Lal has made a very painstaking survey of the District, visiting village after village, both along the river-banks and away from the same. As a result, he has brought to light 150 sites, associated variously with the Black-and-Red Ware, Painted Grey Ware, Northern Black Polished Ware and Early Historic (Red Ware) Cultures[1]. After making a very critical analysis of the data so achieved, he has succeeded in presenting a very interesting picture of the settlement-pattern in the District, from about the second half of the second millennium B.C. to the beginning of the Christian era. The text is supplemented with many distribution-maps and statistical Tables which convincingly show that, within Kanpur District itself, the ancient settlers found the Ganga-Rind *doab* environmentally more favourable than the Ymuna-Rind *doab*—a situation which holds good even today. The analyses also show how the number of settlements as well as their sizes kept on growing from the Black-and-Red Ware Period through the PGW and NBPW days up to the historical times, how the settlements began to come up even away from the river-banks from the NBPW times onwards and how regional centres began to develop, which may have ultimately given rise to cities.

I am sure the book will be of immense use to all those interested in Indian archaeology and should, I believe, serve as a model for younger researchers for prosecuting their own field-studies.

At the end, I would like to congratulate Dr. Makkhan Lal on his excellent work. At the same time, I would also like to impress upon him the need to keep up the momentum.

—B.B. Lal

Shimla
15 August 1984

1. It is quite likely that there may also exist a few sites of the Ochre Colour Ware in this District, since Sringaverapura, further downstream, in Allahabad District has yielded this Ware. However, the difficulty with the OCW sites is that they do not show any mound-like configuration and are, therefore, likely to be missed.

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Preface

This book is thoroughly revised version of my thesis approved for Ph.D. degree by the Poona University. In the Introduction I have tried to explain—too briefly, I am afraid—the nature of the work. However, the main focus of the work is towards the understanding the settlement patterns and systems in the Ganga-Yamuna doab during the second and first millennium B.C. by taking Kanpur district as a case study. While the main focus is on the settlement patterns and systems analysis, it was thought necessary to provide a comprehensive but brief and up-to-date account of the protohistoric and early historic cultures of the Ganga-Yamuna doab. These cultures have been discussed in such a way that not only the archaeological history of the area emerges but also the personality of each culture comes out clearly. This will help us in understanding the changing history of settlement patterns and systems in the Ganga-Yamuna doab better. Further, all the important features of the archaeological cultures of the doab have been put together for the first time. This should be useful to the professionals as well as amateurs.

It has to be kept in mind that the settlement patterns and systems have not only been viewed as the outcome of the interaction between the technology and the environment but also an attempt has been made to compare the past patterns with the present one. Thus, it is desirable as well as important to have an understanding of the cultures and the ecology of the area and also the present day human setting. And for this matter besides discussing the early culture I have given a detail account of the ecology and present pattern of human setting in Kanpur district.

However, I am aware of the limitations and the methodological problems involved with this kind of work, reader should keep in mind that this is the first work of its kind on the archaeology of the Ganga-Yamuna doab and for that matter in Indian archaeology. Since there was no parallel example available the present work may be regarded as modest beginning towards the understanding of archaeological cultures of India on the new line of approach generally known as 'Spatial Archaeology' or 'Settlement Archaeology'.

It is my pleasant duty to acknowledge many individuals and institutions from whose help and advice I have been benefited. To Prof. V.N. Misra I owe

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my first and greatest debt. For his help, encouragement and guidance I owe him much more than I can express. He allowed me the greatest latitude in respect of my views but insisted upon careful documentation and precise expression. He read my manuscript with great care and understanding. The text was considerably refined in his hands. However, I alone, am responsible for many shortcomings which remain in the book.

I would like to acknowledge the help and encouragement given by Prof. H.D. Sankalia. He took keen interest in my work and allowed me to discuss many problems with him and brought to my notice several points which he thought relevant. I am particularly indebted to Dr. K.K. Thaplyal among whose pupils I have the privilege to count myself. It was Dr. Thaplyal who taught me the first lessons in archaeology and encouraged me to choose archaeology as my career. He read the inscription found at Nonha Narsingh in Kanpur district. I would like to express my sincere thanks to Profs. S.B. Deo, R.V. Joshi and M.K. Dhavalikar, Director and Joint Directors respectively of Deccan College for awarding me a fellowship to carry out the present study.

I have been benefited at various points from discussions with the members of staff and the 'Discussion Group' of Deccan College. I am thankful to all of them. I would particularly like to mention Dr. M.L.K. Murty for his discussions on the section dealing with the population estimates for the protohistoric and early historic periods and to Dr. M.D. Kajale for identifying the charred grains from Radhan.

I am particularly thankful to Prof. B.B. Lal, Prof. Lallanji Gopal, Prof. D.P. Agrawal, Drs. S.P. Gupta, D.K. Chakrabarty, Dr. Purushottam Singh, Prof. Romila Thapar and Shri K.N. Dikshit who have always been generous in providing both published and unpublished data, advice and encouragement. Often questions put by them have widen my horizon.

I am grateful to Prof. B.G. Trigger and Prof. P.E.L. Smith for giving help in various ways. Prof. Trigger sent all his publications on theoretical archaeology and always replied my many queries. In spite of his busy schedule during his short visit to Deccan College, Prof. Smith was very kind to go through some parts of my manuscript and suggested several improvements.

Many friends in Deccan College and outside have helped me in various ways. For want of space all of them cannot be listed here but a few deserve individual mention. They include Daniel Miller, R.K. Ganjoo, A.M. Hegde, U.S. Moorti, Paul Risman, Frank Harman, Salahuddin, Christine Spoerel, Milica Bakić, P. Gunindra Singh, S.C. Nanda, R.P. Pandey and Shri R.K. Awashti. I sincerely thank all these friends.

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My thanks are also due to Shri V.B. Belsare, librarian of Deccan College library and his staff. They always helped me whenever a book was needed or there was some problem with the references. Thanks are also due to Shri R.B. Sapre for preparing the maps and to Shri S.K. Jagtap for the drawings of the pot sherds.

During the fieldwork in Kanpur district several individuals have helped me. However, I would particularly like to mention Shri Prakash Narain Dikshit of Sheorajpur.

Thanks are also to my wife, Neelu Srivastava, for kindly helping me in preparing the index and typing it.

I am thankful to all the staff of B.R. Publishing Corporation for their unstinted co-operation in seeing this volume through.

In the last but not least, once again I would like to express my sense of gratitude and thankfulness to Prof. B.B. Lal who has always been helpful to me and has further obliged me by writing a *foreword* to this book.

—Makkhan Lal

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1

Introduction

"No natural history can be interpreted in the absence of at least some implicit body of intertwined theoretical and methodological belief that permits selection, evaluation and criticism".

—Thomas S. Kuhn
(1962 : 16-17)

THE archaeology of the Ganga-Yamuna doab occupies a very significant place in Indian archaeology. This is not only because the region falls between two great and sacred rivers of India but also because it witnessed an all round development in the fields of material culture, religion, philosophy and rise of political powers in early India. The doab was also the first region to experience the process of the second urbanization on Indian soil that commenced around the 6th century B.C.

The potential and importance of archaeology in the doab was recognised with Sir John Marshall's excavations at the site of Bhita, near Allahabad at the beginning of this century (Marshall 1912-13). But no systematic work was undertaken till the forties. The active period of archaeological research in the Ganga-Yamuna doab begins with the excavation at Ahichchhatra by A. Ghosh (Ghosh and Panigrahi 1946). The real impetus to archaeological work in the doab and,

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indeed, in the whole Ganga valley came with the excavation at Hastinapura and explorations in adjoining areas by B.B. Lal in the early fifties (Lal 1954-55). Lal's work provided the stratigraphic sequence and tentative chronology for the early cultures of the doab. Since then, archaeological research in the area has proceeded without interruption. Every year brings a new harvest of information. Explorations have brought to light a large number of sites of the Late Harappan, OCP, PGW, NBPW and Early Historic periods and given a fair idea of the distribution area of these cultures. Excavations carried out at several sites have clearly established the stratigprahy and chronology of various cultures.

Though by now nearly 30 sites have been excavated in the doab, all the excavations are of a small and vertical nature. So far not a single site has been excavated horizontally. This fact naturally limits our knowledge of the cultures of the area. Another factor affecting our knowledge is the delay in the publication of excavation reports. Of the nearly 30 excavated sites, full reports of only three, namely Bhita (Marshall 1912-13), Hastinapura (Lal 1954-55) and Kausambi (Sharma 1960, 1969), are available. For the rest of the sites one has to be content with small notes Published in *Indian Archaeology : A Review.*

Settlement pattern studies of the type carried out by archaeologists in the Middle East, Europe, and the New World have only recently begun in India (Dhavalikar 1977, 1978; Dhavalikar and Possehal 1974; Chitalwala 1979, 1982; Possehl 1980). No such study however has yet been made in the Ganga-Yamuna doab. Because of the lack of horizontal excavations and intensive exploration of limited areas we do not have a clear picture of the pattern of distribution, density and spacing of settlements in different cultural periods and the role of ecological factors in shaping these aspects of the cultures. Nor do we have any idea of the aggregate population of the area, its density and its movement. Other cultural aspects like the changes in settlement patterns due to change in population density, technology and exploitation of economic resources also remain unknown.

The present study is an effort to understand the spatial aspects of early cultures, like the total number of settlements, their size, spacing between the two settlements, pattern of the disperson of settlements, size of the population and its distribution over the landscape and the site catchment area during the different cultural periods in the Ganga-Yamuna doab. For this purpose besides using the already published data, intensive explorations were carried out in a limited area which could be taken to represent the Ganga-Yamuna doab at micro scale. Efforts were made to locate all the archaeological settlements in the area and measure their size as accurately as possible. Also detailed observations were made regarding the geographical setting of the sites. The data obtained from the field work has been analysed carefully by using different archaeological, geographical and anthropological models, to study the various spatial aspects of early cultures.

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The present study can be termed as the third level of the three levels of settlement pattern studies suggested by Trigger (1968). The analysis of archaeological data has been made in the context of ecological factors and the technology available during various cultural periods.

The area selected for intensive exploration is Kanpur district. The extremities of the district are marked by the parallels of 25°26′ and 26°28′ N latitude 79°31′ and 80°34′ E longitude.

Besides the introduction (Chapter I) the thesis contains 6 other chapters grouped into three parts.

Part one contains two chapters (II-III). Chapter II describes the present day ecology of the Ganga-Yamuna doab and a brief history of the area. Chapter III gives a review of the known data about the early cultures of the Ganga-Yamuna doab.

Part two contains only one chapter (IV) which deals with the contemporary setting of Kanpur district. Besides describing the ecological factors at micro level this chapter contains a detailed analysis of the pattern of agriculture and population distribution in the district. An attempt has been made to show the relationship between micro level ecological variations and the pattern of agriculture and population distribution.

Part three contains three chapters (V, VI and VII). Chapter V gives brief description of sites found during exploration—their location, size and material remains found on them. Chapter VI deals with settlement patterns and systems in Kanpur district. It is divided into seven sections which deal with the development of the concepts of settlement pattern and system, size and distribution of settlements, size and spacing of settlements, nearest-neighbour analysis, development of hierarchies, population distribution and site catchment area. For studies included in this chapter various models given by geographers, anthropologists and archaeologists have been used.

There are several limitations in this work which have been mentioned in the following chapters. I would only like to emphasize here that the contribution of such studies is not their absolute but relative values of floor area, population etc. for successive cultural periods. In spite of considerable margins of error involved in various reconstructions, it is felt that such exercises have to be undertaken if we are to progress beyond a knowledge of material culture to the process underlying cultural change.

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PART ONE

(II) ECOLOGICAL SETTING OF THE GANGA-YAMUNA DOAB

(III) PROTOHISTORIC AND EARLY HISTORIC CULTURES OF THE GANGA-YAMUNA DOAB

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2

Ecological Setting of the Ganga-Yamuna Doab

". . . on the one hand culture can be understood primarily only in terms of cultural factors, but on the other hand no culture is wholly intelligible without reference to the non-cultural or so called environmental factors with which it is in relation and which condition it."

—A.L. Kroeber
(1969 : 350)

THE Ganga-Yamuna doab[1] forms a small part of the large Indo-Gangetic plain which is not only the largest alluvial plain in the world but also supports on its cultivated surface nearly half of South Asia's population. The doab covers an area of about 69,000 sq. km. To the west of the doab lie the plains of Panjab. To the southwest the doab abuts upon the outlying spurs of the great elevated plateau of central India. To its northwest lie the plains of Rohilkhand and Oudh. To the southwest of the Yamuna lies the tract of Bundelkhand, which for a few kilometres differs little from the level country to the north. Beyond this

1. Persian word meaning "the country between two waters (rivers)".

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hills appear, at first isolated, then gradually assuming the formation of groups and ranges and finally merging into the Vindhyan and Kaimur chains. To the north of the doab is the marshy belt of land known as *Tarai*. Between it and the Himalayan hills lies a belt of waterless jungle known as *Bhabhar*, formed of boulders and debris of the lower ranges of the Himalayas and extending from 8 to 20 km. in width. To the west of the *Bhabhar* lie the valleys of Kotla, Patli and Dehradoon.

Physical Features

The Ganga-Yamuna doab mainly consists of gently inclined alluvial plains dipping towards southeast. It is an extremely difficult task to delineate regional divisions in this featureless plain. For hundreds of kilometres the only reliefs seen are buffs, leaves, dead arms of river channels and existing rivers. In contrast to the nominal relief to the north of the Ganga drained by sluggish rivers like the Ramganga, Gomati and Sai, the Ganga-Yamuna doab exhibits a more prominent *bhangar* land rising up to 15-60 m. above the adjoining flood plains, the *Khadar*. The slope is generally less than 30 cm. per km. Because of a very gentle slope the movement of water is very slow. The streams like Kali, Hindon, Rind, Pandu and Sengur run parallel to their master streams for quite a distance before emptying themselves into the larger rivers. The area south of Bulandshahr and north of Etah consists of a silty or clayey *bhangar* tract. Sand ridges alternated by depressions in Bulandshahr, Mathura, Aligarh and Etah make this portion of the doab more diversified than its counterparts in the north and south. The patches of saline and alkaline efflorescence which are a result of the gentle slope and excessive quantity of soluble salts in the alluvium are the main characteristic features of the *bhangar* land.

A very different topography is seen in the lower Yamuna tract. Due to the erosional effect of rain water on soft alluvial soils bordering the banks, deep and intricate ravines have been formed. These extend from 3 to 5 km. away from the river banks.

Molony (1905) thinks that the whole area of the Gangetic plain must at one time have consisted of a network of morasses and river channels, very much similar to the present Sundarbans.

Nevill (1908 : 8) gives a beautiful account of the landscape of the doab as it changes its face in response to the seasonal rhythm of the climate.

> "The greater part of the provinces consists of a level plain, the monotony of which is broken by the numerous village sites and groves of dark olive mango trees which meet the eye in every direction. The great plain is, however, highly cultivated and the fields are never bare except during hot months, after the spring harvest has been gathered,

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and before the rainy season has sufficiently advanced for the autumn crops, to have appeared above the ground. The countryside then puts on its most desolate appearance ; even the grass withers, and hardly a green thing is visible except a few patches of garden crops near village sites and the carefully watered fields of sugar-cane. At this time the *dhak* trees burst forth with brilliant scarlet flowers in striking contrast to their dusty surroundings. With the breaking of Monsoon in the middle or end of June the scene changes as if by magic ; the turf is renewed, and tall grasses begin to shoot in the small patches of jungle. Even the salt *usar* plains put on a green mantle which lasts for a very short time after the close of the rains. A month later the autumn crops rice, the millets and maize have begun to cloth the naked fields. These continue to cloth the ground till late in the year, and are succeeded by the spring crops—wheat, barley and gram. In March they ripen and the great plain is then a rolling sea of golden corn in which appear islands of trees and villages . . . ."

Geology

Geologically the north Indian plain is not very exciting. It was a deep basin in Pre-Tertiary times which has been filled in by the Tertiary rive-borne debris from the peninsular and later supplemented by the upper and post-Tertiary Himalayan debris known as alluvium. The deposition started taking place during the last phase of the Siwalik formation and has continued all through the Pleistocene up to the present.

The origin of the deep basin which forms the vast plains of today is a matter of conjecture and controversy. Suess (Wadia 1975 : 364) suggested that the basin is a "fore deep" in front of the high crust waves of the Himalayas as they were checked in their southward advance by the inflexible solid land mass of the Peninsula. But Sir Sydney Burrard suggested that the Indo-Gangetic plains occupy a "rift-valley" (Wadia 1975 : 364).

Though the absolute thickness of the alluvial deposit is a matter of debate, on the basis of geological considerations Oldham (1917 : 213-46) guessed the thickness to be between 4 and 6 thousand metres. The recent gravity, magnetic and seismic surveys show that to the south of Bulandshahr the average thickness is between 1,300 and 1,400 metres with a maximum 8,000 m. at the foot of the Himalayas (Wadia 1975 : 365). At Lucknow a bore hole with a depth of 435 m. did not strike bed rock. This shows that the thickness of alluvial deposit is not uniform. There is a gradual thinning of the alluvial deposit towards the south until it merges with the irregular edge of the peninsular block. Wadia (1965 : 364-65) holds the view that underneath the alluvium are Siwaliks and older Tertiary sediments of the Himalayan piedmont, below which are more consolidated older formations like Gondwana and Cretaceous rocks.

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The alluvial deposit is of two types : *bhangar* and *khadar*.

The *bhangar* or the older alluvium, occupying the zone above the existing flood plains belongs to the Middle Pleistocene. Its general level is 3-4 m. above the highest and 15-20 m. above the lowest level of the bed of Ganga. The calcium carbonate nodules (*kankar*) are found everywhere in *bhangar* land, from the surface down to 10-15 m. depth.

Khadar or younger alluvium occupies the flood plains. Its source lies partly in the erosion of the *bhangar* and partly in the fresh sediments brought from the Himalayas. It is free from *kankar* and *reh* (alkaline soil).

Drainage

The doab is drained by the Ganga, the Yamuna and a number of their tributaries—Kali, Karwan, Krishni, Hindon, Rind, Sengur, Pandu and Isan (Fig. 1). All the rivers follow southeasterly course in consonance with the general slope of the land. The erosional capacity of these rivers is restricted by the very gentle gradient. The rivers flowing in this area have well defined courses.

Only the Ganga and the Yamuna rise in the Himalayas; all other rivers rise in the plains.

The Ganga, which forms the eastern boundary of the doab, is the most important and sacred river of India. Right from the earliest times it came to occupy an important place in the life of the people who lived along its banks. It has found a prominent place in traditional literature. It is mentioned in the earliest Indian literature i.e. Vedas (*Rigveda* VI. 45.31, X. 75.5) and Brahmanas (*Satapatha Brahmana* XIII. 5.4. 11). According to *Mahabharata* the Bindusara is the source of the Ganga whereas the Jain text *Jammudiva Pannti* mentions Padmahrada as its source. Today Ganga comes into existence only at Deoprayaga where the river Bhagirathi coming from Gangotri in Garhwal is joined by the Alakhnanda on the left side. From Garhwal to Bulandshahr it has southernly course. From Bulandshahr it flows in a southeasterly direction up to Allahabad where it is joined by the Yamuna from the right side. From Allahabad up to Rajmahal it has an easterly course and then once again southerly and finally it meets the sea in the Bay of Bengal. Up to Allahabad the catchment area of the Ganga is about 97,900 km. and its length up to Allahabad is nearly 1,500 km.

Yamuna is the first major tributary of the Ganga to join from the right side. Like the Ganga it has also attracted the people of India right from earliest times and has been frequently mentioned in traditional literature. It is mentioned in the *Rigveda* (X. 75.5, V. 5.2, VII. 18.19), *Atharvaveda*(IV. 9.10) and *Aitareya Brahmana* (VIII. 14.4). It seems that during the Vedic period the Saraswati and the Yamuna were much better known and important than the Ganga (Law 1954 : 31-33, 135-6).

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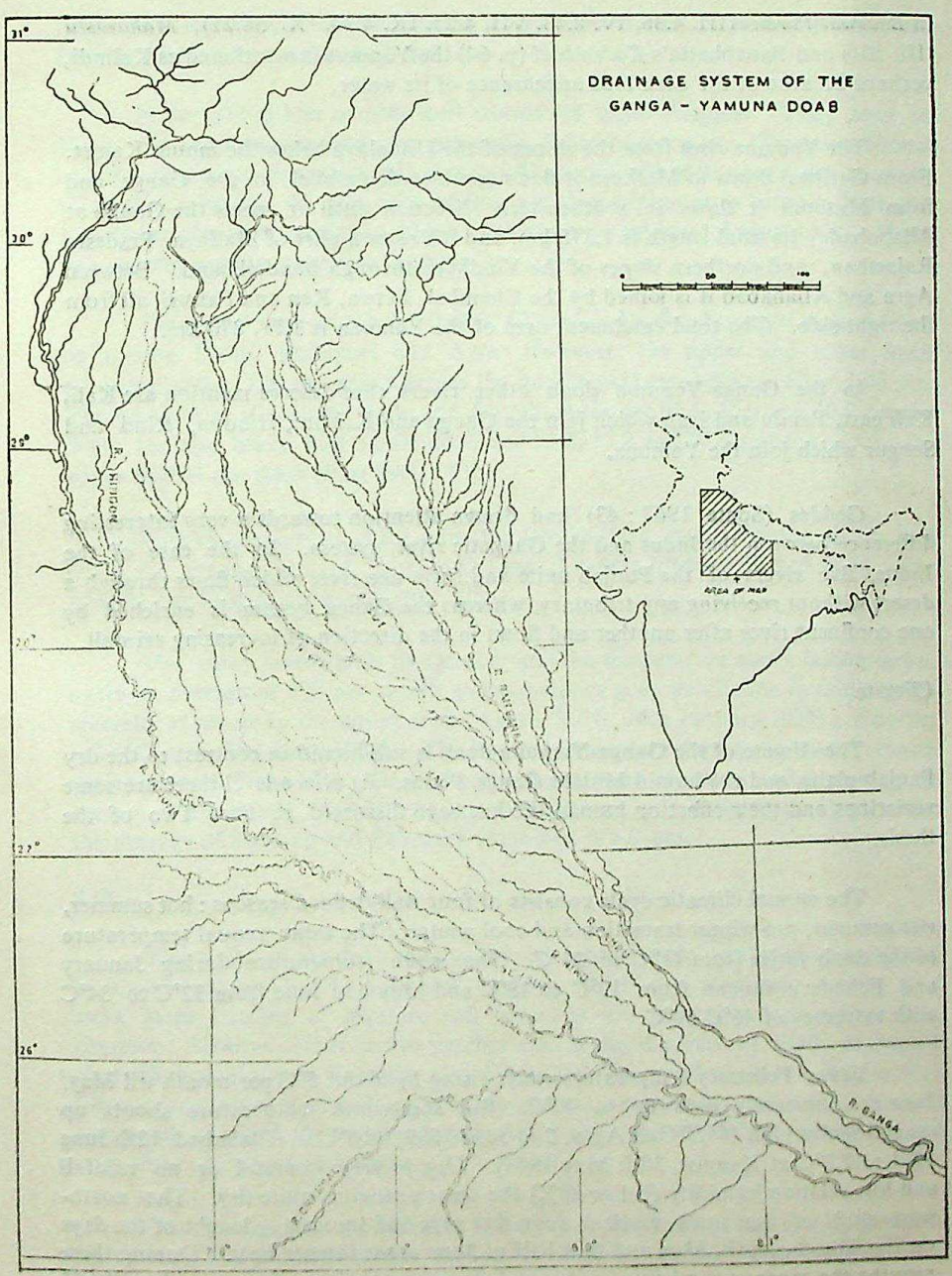

FIG. : 1.

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In *Bhagwat Purana* (III. 4.36, IV. 8.43, VII. 4.23, IX. 4.30, X. 58.22), *Mahavastu* (III. 201) and Banabhatta's *Kadambari* (p. 64) the Yamuna is mentioned as Kalindi, perhaps because of the dark blue appearance of its water.

The Yamuna rises from the slopes of the Himalaya below the mount Kamet. From Garhwal down to Mathura it flows southwards parallel to the Ganga and from Mathura it flows in southeasterly direction until it meets the Ganga at Allahabad. Its total length is 1,375 km. and it drains a part of Madhya Pradesh, Rajasthan, and northern slopes of the Vindhyas through Bundelkhand. Between Agra and Allahabad it is joined by the Chambal, Betwa, Ken and Paisuri, all from the right side. The total catchment area of the Yamuna is 3,71, 870 km.

In the Ganga-Yamuna doab other rivers that deserve mention are Kali, Kali east, Pandu and Isan which join the Ganga and Krishni, Hindon, Rind and Sengur which join the Yamuna.

Geddes (Spate 1967 : 43) had drawn attention towards a very interesting difference between the Indus and the Gangetic river system. In the case of the Indus, five rivers of the Punjab unite and form one river which flows through a desert without receiving any tributary, whereas the Ganga system is enriched by one confluent river after another and flows in the direction of increasing rainfall.

Climate

The climate of the Ganga-Yamuna doab is sub-humid in contrast to the dry Panjab plains and the humid Middle Ganga Plains. At micro level there are some variations and their effect on human life has been discussed in Part Two of the thesis.

The annual climatic cycle consists of four well-defined seasons : hot summer, wet summer, pre-winter transition and cool winter. The mean annual temperature of the doab varies from 11°C to 26°C. The mean temperature during January and February ranges from 13°C to 18°C and May and June from 32°C to 34°C with extremes of 46°C-50°C.

From February temperature starts rising by about 5°C per month till May/ June and normally goes up to 40°C. But sometimes temperature shoots up exceptionally high (43.3°C at Agra, 2nd June 1889; 48.8°C at Allahabad, 12th June 1901 ; 47.2°C at Kanpur, 30th May 1941). Due to very nominal or no rainfall and low relative humidity (below 40%) the season remains quite dry. The north-west shift of the sun's vertical noon day rays and increasing lenght of the days during March, April, May and first half of June cause intense heat. During these months the average wind (*loo* i.e. hot and dry westerlies) speed is more than 10-12 km. per hour for an appreciable number of hours during the day. These hot

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winds are sometimes accompanied by violent dust storms. The afternoon hours during this season are extremely hot.

In the second half of June dust storms are quite frequent. They tend to lower the temperature and are generally followed by rains. The mean annual rainfall of the last 90 years (1861-1950) is 99.16 cm. with a standard deviation of 27.86 cm. Nearly 90 per cent of the annual precipitation is between June and September of which more than 60 per cent comes in July and August only. These two months are the wettest in the year.

The lowest zone of rainfall (below 60 cm.) is bordered by a triangle formed by joining Delhi, Mainpuri and Agra. However, the upper and lower doab experience 80 to 120 cm. rain whereas the middle part gets between 60 and 90 cm. The percentage of normal, flood and drought spells are 41.1, 15.0 and 40.9 respectively for the lower half of the doab and 53.6, 12.0 and 34.4 respectively for the upper half of the doab (Puri 1960 : 332).

With the beginning of the rains the temperature starts coming down and from the second half of June to October it ranges between 30 and 40°C. The relative humidity remains well over 70%.

The rainy season ends by October and the temperature starts falling down, again an average of 5°C per month and sometimes goes well below freezing point specially at places in the upper doab (Agra—2.2°C, 16th January 1935) ; Roorkee —2.2°C, 2nd February 1905). The lowest temperature during the winter months varies between 5 and 9°C. Generally the sky remains cloudless and frost is quite common. The winter rainfall is of some significance only in the upper doab where the average of January and February combined is 5.0 cm.

Soils

The soils of the doab tend to become heavier from northwest to southeast. In the districts of Aligarh, Agra and Mathura, which are very near to the arid zone, large patches of alkaline soil (*usar*) as well as wind-borne sand are quite common. Alkaline soil occurs in patches also in the districts of Etah, Mainpuri, Farrukhabad, Kanpur, Fatehpur and Allahabad. On weathering, the alkaline soils liberats large amount of sodium, calcium and magnesium salts and sulphurous acid as a result of which the soil becomes unfertile and supports only a grassy growth with little or no tree vegetation.

The *khadar* soils are found in the areas of flood plains and are quite rich in nutrition. The p^H value ranges between 6 and 8. It has been observed that locally the Ganga *Khadar* soils have an immature profile with sandy to silty texture, contain high percentage of lime and are alkaline in reaction. On the other hand

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the Yamuna *Khadar* soils have a sub-mature profile with a predominance of clay concretion.

The *bhangar* soils are more extensively spread. The percentage of soluble salts exept in the soils of lowlying areas where waterlogging takes place is low and the soils are neutral to slightly acidic in reaction. The calcium content generally increases at lower depths. The *bhangar* soils are generally poor in phosphoric acid, nitrogen and other organic matter.

Flora

The vast alluvial plain of the doab as we see it today is the result of continuous deforestation from the second millennium B.C. to the present. Across the bare plain of today there once existed a dense, moist and luxuriant forest of sal (Stebbing 1922, Calder 1937). In the traditional literature we have ample evidence for the doab being a dense forest. *Satapatha Brahmana* (1.4 : 1.4, 14, 15, 16) mentions that the area between Saraswati and the Sadanira (modern Gandak) rivers was a dense forest and Aryanisation of it was made possible only after burning the forest. It was also cultivated subsequently. According to *Mahabharata* Hastinapura, the capital of the Kurus was situated in a forested area and the Pandavas after the division of the Kingdom founded the city of Indraprastha (modern Delhi) only after clearing dense forests. The kingdom of Panchala—modern districts of Bareilly, Badaun, Pilibhit, Rampur, Farrukhabad, Etah, Ethwah, Kanpur—was founded in the Kuru jungle (Law 1954 : 40, 115). The kingdom of Kuru which occupied the area of upper doab was also situated in the forest and both towards its north and south was the forest called Kuru Jungle. *Devipurana* (Chapter 74) mentions nine sacred forests of which Kuru Jungle, Nimisa (Naimsaranya) and Utpalaranya covered the doab. Naimsaranya has been identified with modern Nimsar, 20 km. north west of Sitapur district. In Naimsaranya forest several thousand sages lived and many *Puranas* were written here. Utpalaranya was the forest where the sage Valmiki lived and Sita gave birth to her twins Lava and Kusha. Some scholars have identified this place with Bithur 20 km. north of Kanpur where there is still a Valmiki ashram (Law 1954: 40). Opposite across the river Ganga, is Pariar where two small temples are dedicated to Sita. According to local tradition this was the place where Sita lived during her exile from Ayodhya.

Pollen records from Hastinapur excavations show the presence of *Pinus*, *Dalbergia sissoo* (Wild sissoo) and *Holorabera anthidysentrica* (Kurchi) (Chowdhury *et al.* 1951 : 3). Samples of charred wood from the OCP to the NBPW levels at Atranjikhera belong to *Pinus roxburghii* (Chirpine), *Delbergia sissoo* (Sissoo), *Tectona grandis* (Teak), *Boehmeria Platypylla* (Indica ramie), *Cedras deodara* (Deodar), *Cupressus torulosa* (Himalayan cypress), *Terminalia tomentosa* (Laurel), *Tamarix articulata* (Farash), *Dendrocalamus strictus* (Male Bamboo), *Acacia nilotica* and *Acacia arabica* (Babool) (Chowdhury *et al.* 1977). The

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presence of these species some of which are now confined only to the *Tarai* region shows that the doab was quite densely forested during the 2nd and 1st millennium B. C. Pant (Agrawal 1971 : 225) says that in the past the fauna of Siwaliks included carnivores, monkeys, elephants and ungulates suggesting that the Indo-Gangetic plains had a thick flora like that of the *Tarai* and *Bhabhar* regions. Stebbing (1922) and Calder (1937) also mention that until a few centuries back the doab was a thick forest.

The remnants of early forests can be seen in the patches of trees and plants like *Butea frondosa, Caseria tomestosa, Alienthus excelsa, Woodfordia floribunda, Melia indica, Basia latifolia Acacia leucophoria* and other species of *Bahunias* and *Eugenia* on the new alluvium along the larger rivers and *Bambax malabaricum, Adina cordifolia, Logerstroemia perviflora, Lannea grandis. Goruga pinnota, Ganalina arboria, Casia fistula, Randia longispina, Zigyphus jujuba, Mallotus philippenensis, Calli.arpa macrophylla etc.* in most of the sub-Himalayan tract of upper doab (Puri 1960 : 212-15). In the central doab thorny shrubs such as *Alhagi maurorum, Caparis aphylla, Prosopis spicigera, Tecoma undulata* and *Salsola kali* can be seen along with species of *Grevia* and *Acacia.*

In fact, no ther part of India has undergone such a drastic change due to the village of jungle land. Considerable damage to the forests of the doab was also done by the railways which obtained their fuel supply directly from local timber until a century ago. (Whitcombe 1972 ; 95). The intensive colonisation and large-scale deforestation has brought the balance between man and vegetation to a very delicate stage. Mukharjee (1938 : 97-103) sums up :

> "Nowhere is this interaction between man and vegetation so vividly illustrated over an extensive area than in the Gangetic plain. The balance between progressive tendencies of vegetation and retrogressive tendencies of man is nowhere more evident than in the vegetation of this region. Throughout the Gangetic plain the vegetation may be said to have attained now on the whole an apparent equilibrium in relation to variation in rainfall and temperature which at any moment is liable to be upset. . . ." He further adds, "On the plains vegetation is rather delicately balanced against man at about the dry grass land or the thorn scrub stage. The soils over most of the Indo-Gangetic plains seem to be supporting all the human and bovine life that is possible under existing methods of exploitation. Increase in intensity of exploitation results in further destruction of natural vegetation and the amount and the character of vegetation sets a limit to the amount of animal life. Relaxation in pressure immediately results in a movement of the vegetation towards the climax. But no relaxation is possible under present conditions. Dry grass land thorn scrub formation remains practically stationary." (Mukharjee 1938 : 97-103).

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Fauna

The faunal species that we see today are not the same as those of early times. Today only wolves, foxes, jackals, and hyenas are found quite frequently in the plains. The leopard is confined only to the ravines of the Yamuna. In the beginning of the present century antelope, wild boar, sambhar, barking deer, spotted deer etc. were found abundantly (*Imperial Gazetteer* of *United Provinces*, 1908).

The existence of the dense forest in the doab certainly meant the presence of large varieties of herbivores as well as carnivores. There is evidence of elephant, lion, tiger, rhinoceros, wild ass, black buck etc. From the older alluvium the fossils of *Elephus antiquus*,*Equus namadicus*, *Mam gigantea*, extinct species of rhinoceros and hippopotamus have been found (Wadia 1975 : 370). Even as late as the 16th and 17th centuries A.D. lions, tigers and elephants were hunted in the Ganga-Yamuna doab (Abdul Fazal : 320). Abdul Fazal also mentions that a large number of elephants were captured near Kuntut in Allahabad. The lion, tiger and other carnivores were very frequently met with in the district of Agra, Mathura, Farrukhabad, Etawah, Kanpur etc. in 16th and 17th centuries A.D. (Nevill 1908 : 8). Now all these, except the lion, are confined in the *Tarai* areas mainly in reserved forests. The Lion is no more found in the area.

Of the birds, the house sparrow is quite common. Other common birds are green parrot, dove, blue-pigeon, crow, black raven, white heron, eagle and vulture. Among the migratory birds we see wild geese, ducks, and teels of many varieties.

Historical Outline

The Ganga-Yamuna doab occupies a very significant place in the political, cultural and economic history of India. In traditional literature it formed part of what has been called Madhyadesha which covered approximately the upper and middle Gangetic plains, the Yamuna Chambal catchment area up to and including the Son valley in the east, Sutlej on the north-west, Himalayas on the north, Aravallis on the west and Satpuras on the south (Ali 1966 : 132). From the Vedic and epic literature it appears that prior to the coming of the Aryans the doab was occupied by people belonging to the Proto-Austroloid race who are mentioned in *Vedas* as *dasas*. Attempts have been made to identify these people with certain archaeological cultures which are discussed in the next chapter. During the Rigvedic time Aryan expansion in the doab is certain as we get a reference to Krvis (Later to become the country of the Panchalas, *Rigveda* VII. 18. 7) who participated in the 'battle of ten kings' on the bank of Parushni (modern Ravi) in which Sudas emerged victorious. But this early colonisation was not on a large scale and the main focus of cultural and political power was the land between the Sutlej and the Yamuna (Mujumdar 1951 : 244). By the

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time of the Mahabharata war, the doab was colonised on a much larger scale and was divided into north and south Panchala, Kuru, Kuru jungle. Usinara and Vatsa Janapadas. It came into prominence only after the shift of political power from the Saraswati basin following the Mahabharata war which took place sometime between 1200 and 1000 B.C. (Majumdar 1951 : 268-70). After this great war the area was mainly known as the country of Kuru-Panchala. The traditional literature mentions that the people of this country were most civilized and the greatest amongst Indians (Law 1954 : 78).

In the beginning, Kuru and Panchala were closely related to the extent that in the *Brahmanas* (*Jaiminiya* 3.6.7.8, 7.5.7.2, *Gopath* 1.2.9) and *Kaushitaki Upanishad* (4.1) they are referred to as a single *rashtra* (nation). But by 6th century B.C. we find that not only the doab but the whole of northern India was divided into several smaller republics (*Janapada*) and monarchical states of which Kuru and Panchala occupied the doab. A part of the eastern doab was occupied by Vatsa and the western part near Mathura by Surasena. The Kuru *Janapada* was the land of Kurus, originally the hinterland of Indraprastha (equivalent to modern Delhi) west of the Yamuna where they first settled. Later they extended their boundaries across the Yamuna and the doab to the Ganga in the east. Indraprastha and Hastinapura are mentioned as the capitals of Kurus (Raychaudhury 1950 : 134). The Panchala *Janapada* extended over the central part of the doab and the southern part of modern Rohilkhand. It was divided into two parts—north and south Panchala with the Ganga forming the boundary line between the two. Kampilya (modern Kampil in Farrukhabad District of Uttar Pradesh) and Ahichchhatra (near Ramnagar in Bareilly district of Uttar Pradesh) were the capitals of south and north Panchala, respectively. A great struggle raged between Kurus and Panchalas for the possession of north Panchala. Sometimes north Panchala was included in Kururashtra and had its capital at Hastinapura and at other times it had formed a part of Kampilyarashtra (Raychaudhury 1950 : 135). The eastern part of the doab was included in Vatsa with Kausambi as its capital.

With the rise of the Magadha *Janapada* in the 6th century B.C. all other *Janapadas* and states started losing their independence. They finally became a part of the Magadha empire. The expansion of the Magadha empire which started with Bimbisara at the beginning of 6th century B.C reached its climax in the third century B.C. During the reign of Ashoka the great (273-236 B.C.), the Magadha empire became one of the greatest empires of the ancient world. But the integrity of the empire did not last long. Ashoka's successors had neither the strength nor the will to arrest the process of disruption. Soon after the death of Ashoka the Mauryan power declined and the doab fell into the hands of Greek invaders. Manander ruled almost over the whole of northwestern India up to Ayodhya in the east. But soon Pushyamitra Sunga (187-151 B.C.) liberated it from the Greeks.

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It seems that during first century B.C. an independent dynasty of Mitras sprang up in the doab. The coins of this dynasty have been found at Ahichchhatra, Mathura and several other places. During the first two centuries of the Christian era the kingdom of Kushanas showed some stability in the doab. But the confusion and chaos which started after the fall of the Mauryan empire ended only after the rise of Guptas (320 A.D.). From then on, for nearly two centuries, the doab formed a part of the Gupta empire. From *Prayaga Prasasti* of Samudragupta we know that he defeated no less than 9 kings in northern India and annexed their kingdoms to his own and extended his empire up to Delhi. But the legacy did not survive for long. Due to continuous invasions of Hunas from the west and the weakness of the rulers specially after Skandagupta the empire shattered by 550 A.D. and for some time the Hunas under Mihikula (515-535 A.D.) ruled over the entire northwestern India as far Fouth as Gwalior. But the doab remained a cockpit of rivalry among the Maukharis, Guptas and Hunas and finally the Maukharis rose to power. With Harsha (606-664 A.D.) as the ruler of Maukhari empire the doab regained its past glory after nearly a thousand years and the city of Kanyakubja, the capital of Harsha, became the poltical and cultural centre of northern India.

Harsha left no successor and the empire crumbled after his death. In the absence of any paramount power the whole northern India got divided into several small states which were continuously warring with one another. Many bitter battles were fought among the Rashtrakutas of Deccan, Palas of Bengal and Pratiharas of Rajasthan to get control over the Ganga-Yamuna doab. The period has been termed as the era of tripartite war for Kanyakubja *desh.*

The period of instability and the continuous infighting of the ruling kings encouraged Muslim invaders. In 1010 A.D. Mahmud saw Kannauj as a "city which raised its head to skies which in strength and structure might justly boast to have no equals" (Cunningham 1924 : 431). He plundered most of northern India and went back to Ghazni with enormous wealth.

The petty kings of northern India learnt no lessons from Mahmud's invasion and infighting went on with the fragmentation of the kingdoms. The second half of the twelfth century and the beginning of the thirteenth century witnessed again tripartite wars among Chahmanas of Delhi, Gahadvalas of Kannauj and Chandelas of Khajuraho. It was due to the enmity and hatred between Chahmanas and Gahadvalas that Muhammad Ghori succeeded in defeating Prithviraj Chauhan (of Delhi) with the help of Jaichanda Gahadvala (of Kannauj) in the battle of Taraine in 1192. Soon after his victory over Prithviraj Chauhan, Ghori gained full control not only over Delhi but also over the doab by defeating Jaichanda himself at Banaras in 1194. And this laid the foundation of Muslim rule in India. Though the local uprising of Jats in the doab never ceased, they were easily suppressed in the absence of any organised attempt to overthrow the foreign power. As during the previous dynasties, the doab constituted the

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granary and backbone of the economy during the reigns of Sultanates and Mughals. Delhi became the capital of the empire and remained so except for a brief period during the reigns of Muhammad-Bin-Tughlaq (1325-51) and Akbar (1556-1605). Akbar shifted his capital from Delhi to Agra to control the area south of the Yamuna and have a firm grip over the doab. But during the reigns of later Mughals, specially after Aurangzeb, (1658-1707) the empire was fragmented again.

This was the most suitable time for the shrewd British to move from the east to the west. In 1803 and 1856 the regions of Agra and Lucknow were annexed to the British empire. Together, these states were named as 'United provinces of Agra and Oudh'. In 1857 the local powers united unsuccessfully to overthrow the British rule. However, the British realized the strategic value of the doab and adopted a softer attitude towards the people. They developed transport and irrigation facilities to accelerate the economic development of the region. The establishment of textile and leather industries at Kanpur developed from a small trade centre to one of the biggest industrial centres of India.

Besides its political and cultural importance, the doab was also the heart of trade routes in ancient times (Majumdar 1968 : 606-07; Motichanda 1966; Ali 1966). The trunk route from Taxila to Tamralipti followed the Himalayan piedmont to avoid the extensive flood plains of large rivers. It passed through cities like Udayanpur, Puskalavati, Hardwar, Govison, Ahichchhatra, Sravasti, Saket, Kapilvastu, Vaisali, Patliputra and Mithila. Another route ran from Jullundur to Tamralipti through important regional cities like Indraprastha, Mathura. Kampilya, Kausambi, Kashi and Rohitashgarh keeping to the south of the Ganga. This was the forerunner of the Grand-Trank road to which Ashoka gave a proper shape and which was metalled by Sher Shah Suri in 1538-45. A.D. The third route that passed tnrough the doab ran from Indraprastha to Ujjainy via Agra. The fourth route was from Indraprastha to Ujjainy passing through the cities of Mathura, Kampilya, Kausambi and then taking a turn to the south for Vidisa and then to Ujjainy. The Ganga-Yamuna doab was connected with almost all parts of India.

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3

Protohistory and Early Historic Cultures of the Ganga-Yamuna Doab

"The culture is not an a priori category elaborated in the studies of philosophers and then imposed from out side upon working archaeologists. Cultures are odserved facts."

—*Gordon Childe*
(*1935 : 3*)

It is useful to briefly review the geographical distribution, characteristic features and chronological sequence of the protohistoric and early historic cultures in the Ganga-Yamuna doab in order to put the cultural sequence of Kanpur district in a proper perspective. Although the succession of cultures from about the middle of the second millennium B.C. onwards is now known without any significant gap and many sites of each cultural phase have been located, the few excavations carried out are of a vertical nature. For this reason both the variety and quantity of materials available for each cultural period are limited. The various cultures of ths doab are therefore identified mainly with the help of distinctive ceramic alone.

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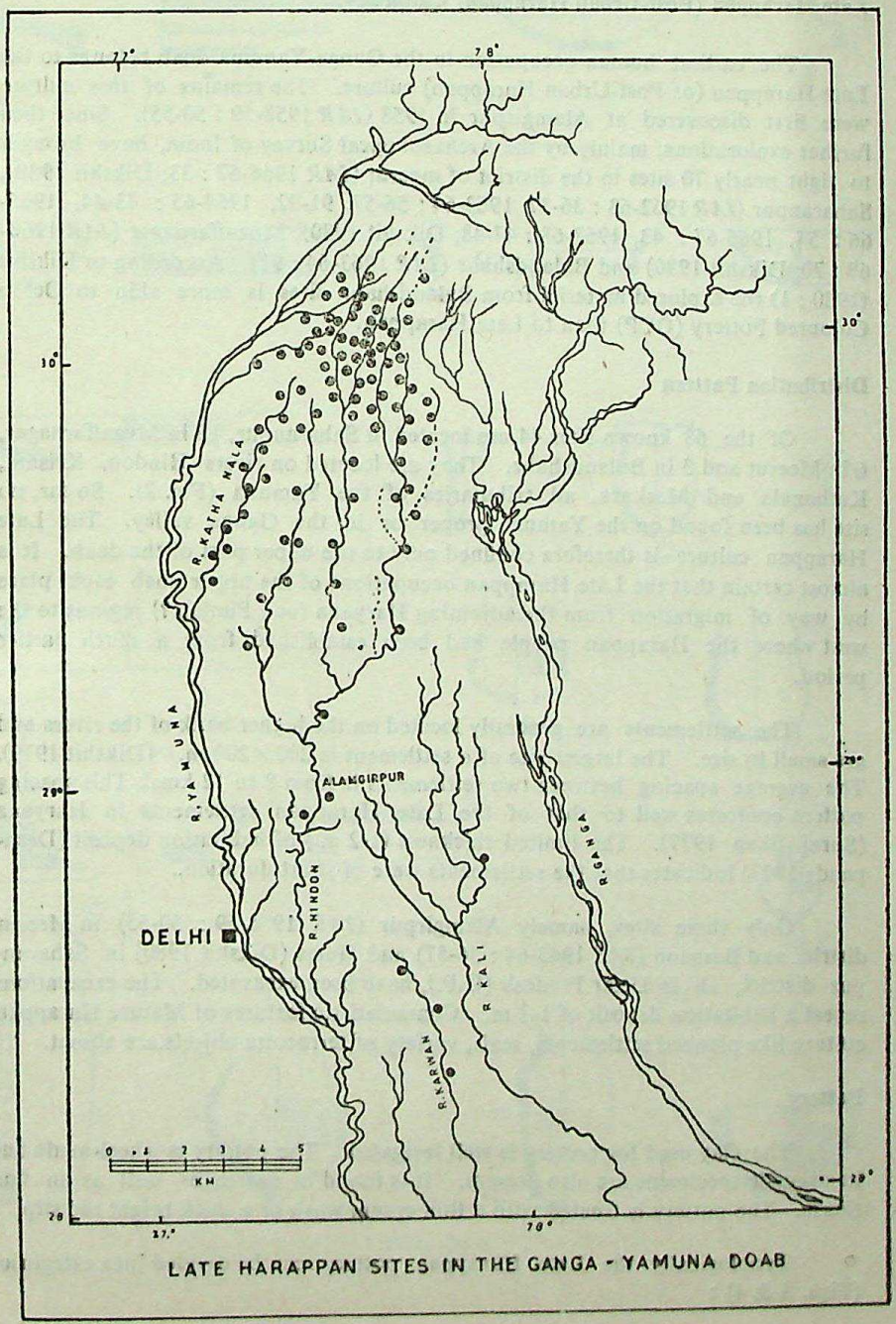

FIG. : 2.

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Late Harappan (Post-Urban Harappan) Culture

The earliest human occupation in the Ganga-Yamuna doab belongs to the Late Harappan (or Post-Urban Harappan) culture. The remains of this culture were first discovered at Alamgirpur in 1958 (*IAR* 1958-59 : 50-55). Since then further explorations, mainly by the Archaeological Survey of India, have brought to light nearly 70 sites in the district of meerut (*IAR* 1966-67 : 33; Dikshit 1980), Saharanpur (*IAR* 1962-63 : 36-37, 1963-64 : 56-57, 91-92, 1964-65 : 43-44, 1965-66 : 54, 1966-67 : 43, 1967-68 : 47-48; Dikshit 1980), Muzaffarnagar (*IAR* 1968-69 : 70; Dikshit 1980) and Bulandshahr (*IAR* 1963-64 : 91). According to Dikshit (1980 : 1) the explored material from Bulandshahr sites is more akin to Ochre Coloured Pottery (OCP) than to Late Harappan.

Distribution Pattern

Of the 68 known sites 44 are located in Saharanpur, 15 in Muzaffarnagar, 6 in Meerut and 3 in Bulandshahr. They are located on rivers Hindon, Krishni, Kathanala and Maskara, all tributaries of the Yamuna (Fig. 2). So far, no site has been found on the Yamuna proper or in the Ganga valley. The Late Harappan culture is therefore confined only to the upper part of the doab. It is almost certain that the Late Harappan occupations of the upper doab took place by way of migration from the adjoining Haryana (and Punjab ?) regions to the west where the Harappan people had been established from a much earlier period.

The settlements are generally located on the higher bank of the rivers and are small in size. The largest size of a settlement is 200×200 m. (Dikshit 1979). The average spacing between two settlements is from 8 to 12 km. This spacing pattern conforms well to that of the Late Harappan settlements in Haryana (Suraj Bhan 1977). The limited thickness (1-2 m.) of habitation deposit (Deshpande 1977) indicates that the settlements were of short duration.

Only three sites, namely Alamgirpur (*IAR* 1958-59 : 50-55) in Meerut district and Bargaon (*IAR* 1963-64 : 56-57) and Hulas (Dikshit 1980) in Saharanpur district, all in Uttar Pradesh (U.P.), have been excavated. The excavations reveal a habitation deposit of 1-2 m. Characteristic features of Mature Harappan culture like planned settlements, seals, variety of terracotta objects are absent.

Pottery

The clay used for pottery is well levigated. The pottery is wheel-made but hand-made specimens are also present. It is found in coarse as well as in fine fabric. The pottery is treated with a thin cream wash or a thick bright red slip.

Typologically the Late Harappan pottery can be divided into categories (Figs. 3 & 4) :

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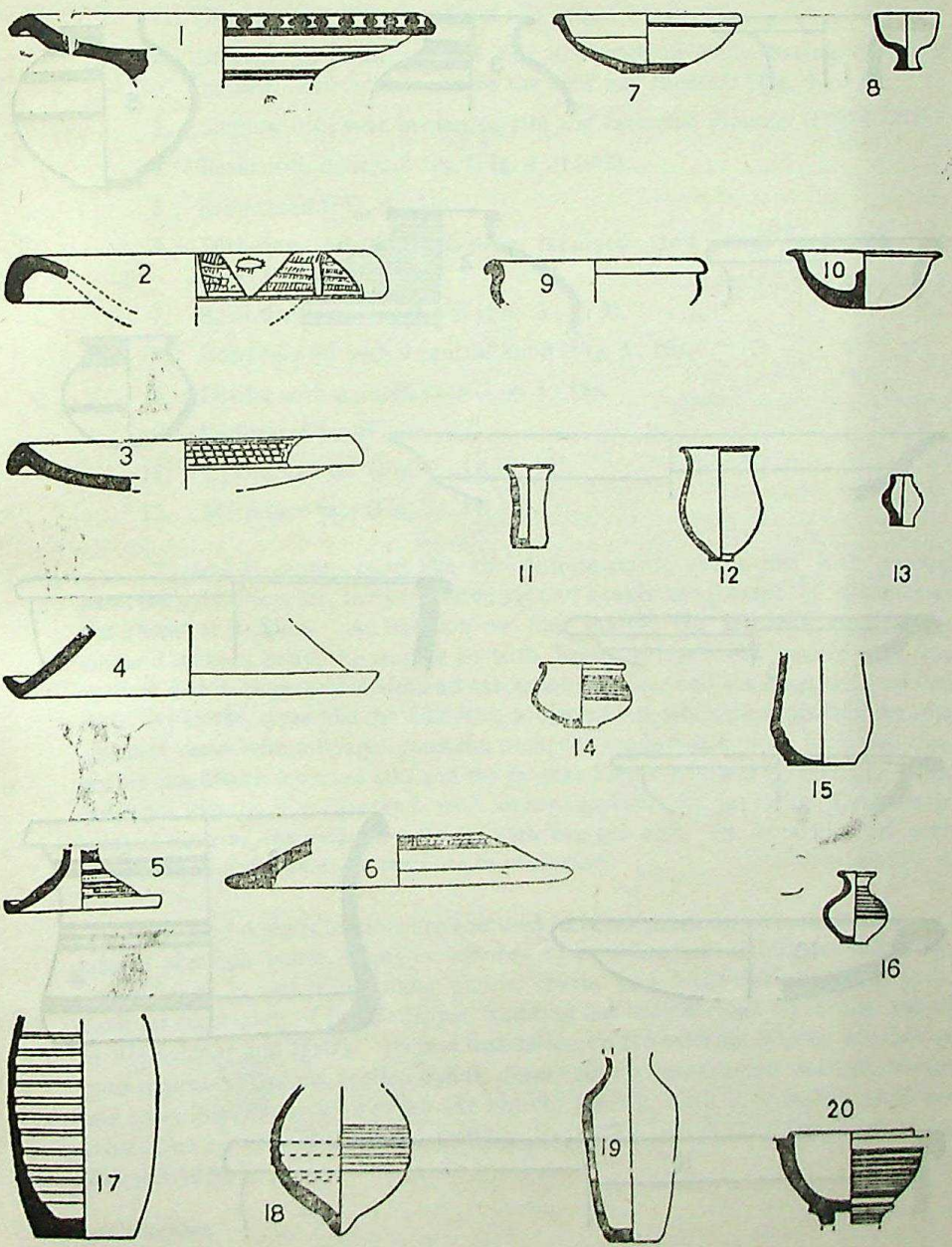

FIG. : 3.

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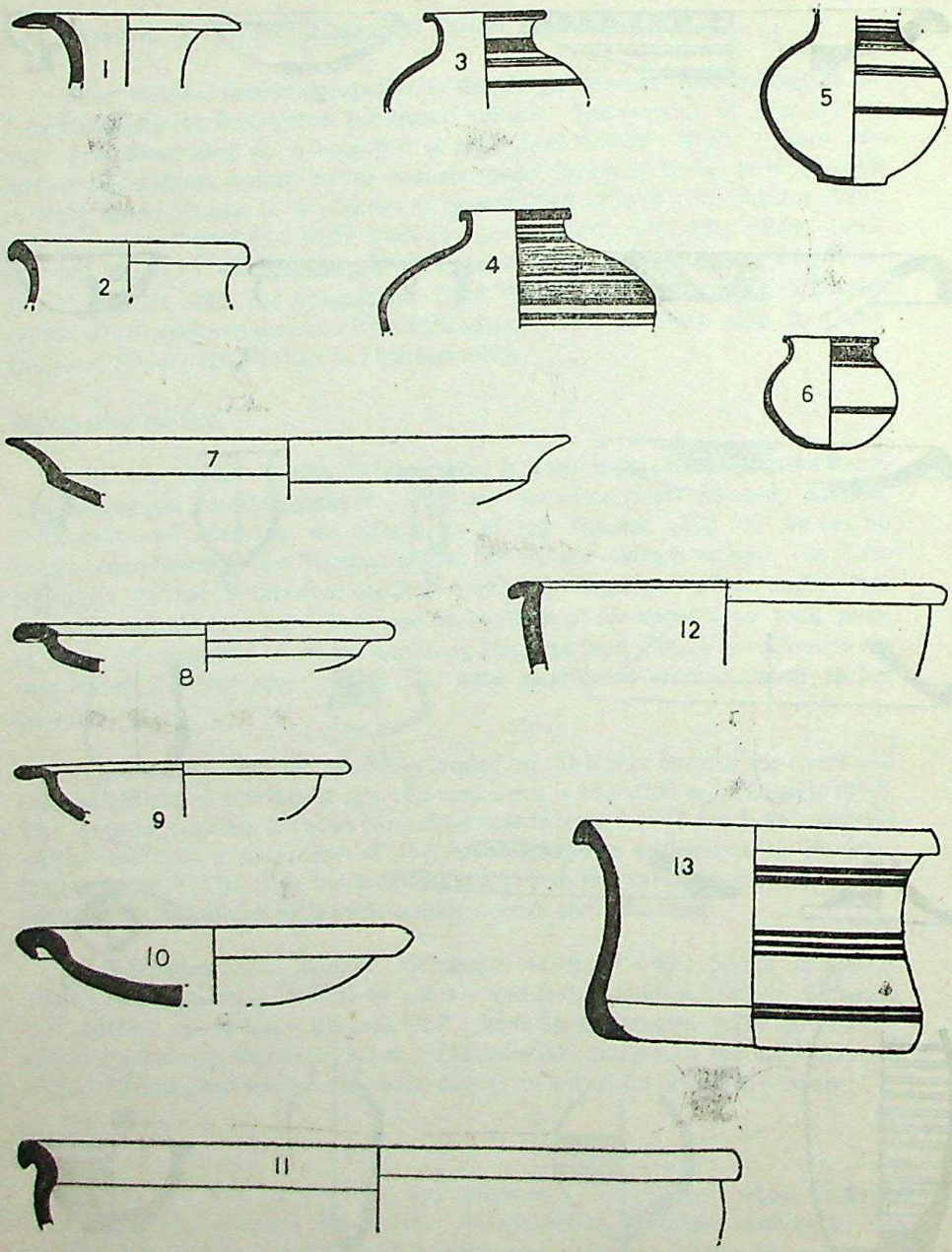

FIG. : 4.

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1. Storage jar with splayed out rim (Fig. 4 . 1-2).
2. Storage jar with splayed rim and bulbous body having traces of parallel horizontal bands on the neck and shoulder (Fig. 4 . 3-6).
3. Shallow dish with projecting rim and carinated shoulder (Fig. 4 . 7-10).
4. Basin with undercut rim (Fig. 4 . 11-12).
5. Ring stand (Fig. 4 . 13).
6. Dish-on-stand with slightly incurved and long drooping rim (Fig. 3 . 1-6).
7. Bowl with an everted rim (Fig. 3 . 7, 9).
8. Bowl-like lid with a central knob (Fig. 3 . 10).
9. Goblet with pointed base (Fig. 3 . 18).
10. Perforated jar (Fig. 3 . 17).
11. Cylindrical jar (Fig. 3 . 11-13, 15).
12. Miniature vase (Fig. 3 . 14, 16).

Typical Harappan types like the dish-on-stand, the goblet with pointed base, the cylindrical jar, the perforated jar and beaker are present at Alamgirpur but absent at Bargaon. At Bargaon we find mainly the jar with splayed out rim and bulbous body, the storage jar with heavy splayed out beaded rim, the shallow dish with projected rim and carinated shoulder and the bowl with everted rim. At Hulas, types like the dish with projected rim and carinated shoulder, the globular vessel with a flange round the neck, the shallow dish with incurved rim, the jar stand with incurved rim and the jar stand with concave profile are rare, but types like the dish-on-stand with drooping rim, the jar with horizontally splayed out rim, the medium-sized jar with everted rim, the bowl-like lid with central knob and miniature pots are in profusion.

Painted designs on pots are executed in black pigment on a red surface and consist of simple bands, triangles, squares, rows of hatched diamonds with horizontal bands, chains with bands, plants, leaves and birds with hatched body. Internal decoration of Pre-Harappan tradition has been noticed on a few sherds at Alamgirpur and Hulas. Incised decoration on the exterior of pots consists of cord-impressed designs, incised bands, deeply cut chevrons, small oblique strokes and wavy lines drawn by a comb-like object. Sherds with incised designs do not exceed one per cent of the total pottery assemblage at Alamgirpur and Hulas (Dikshit 1979a).

Architecture

Excavations have yielded very little evidence of settlement and architecture. At Hulas the living structures were built on 60 to 80 m. thick platforms. No

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houses made of burnt or sun-dried bricks were found. At Alamgirpur a mud wall and a few mud bricks were found. The size of bricks ranges between 28 and 29.5 cm. in length, 13.5 and 15.5 cm. in breadth and 5.5 and 7.0 cm. in thickness. Some burnt bricks were also found but they were too fragmentary in nature for their size to be determined. A few burnt bricks found at Hulas give only an idea of thickness and breadth in ratio of 1 : 2. The scarcity of bricks suggests that they may have been used only in drains or similar other ancillary structures. Houses were made af wattle and daub.

Technology and Material Culture

The only metal tools known are a broken blade from Alamgirpur and a fragmentary chisel from Bargaon, both of copper. Other tools are bone points and chert blades. Among ornaments bangles of terracotta, carnelian and steatite and beads of terracotta and steatite, agate, carnelian and faience are found. Among metal ornaments only a few copper rings have been found from Bargaon. The kitchen equipment is represented only by stone querns and pestles. Among toys we find animal figurines of terracotta, bull-headed toycarts, and cart-wheels with a central hub. The occurrence of the toy cart and cart-wheel suggests the use of bullock carts. Other objects are triangular and circular terracotta cakes.

Subsistence

The only evidence of foodgrains is in the form of rice husk found in the core of pot sherds from Hulas and Un, both located on the bank of Kathanala in Saharanpur and Muzaffarnagar districts, respectively. Besides, the Late Harappan people may have cultivated wheat, barley and other crops known from the Mature Harappan times (Vishnu-Mittre 1979).

Relative Chronology

Dikshit (1977, 1980) has divided the Late Harappan complex in the Ganga-Yamuna doab into two phases. Phase I is characterised by typical Harappan pottery, carnelian, agate and faience beads, terracotta animal figurines, triangular terracotta cakes; stone querns and pestles and burnt bricks. This phase is represented at sites like Alamgirpur in Meerut district, Bhura, Kalhatti, Tatarpur Kalan and Hulas in Saharanpur district. Dikshit thinks that the presence of inscribed pottery at Alamgirpur suggests temporal proximity to the urban phase of the Harappan culture. He puts Phase I between 1700 and 1300 B.C. Phase II is characterised by the dominance of unslipped red ware, similar to the OCP (Ochre Coloured Pottery), in the ceramic assemblage. It is represented at sites like Bargaon, Pilkhani, Bahupur, Hardakheri, Bakaraka, Gathera and Budhakhera in Saharanpur district. Dikshit puts this phase between 1300 and 1000 B.C. But Possehl (1980 : 16-18) has put Alamgirpur and Bargaon together and given a date bracket of 1900-1000 B.C.

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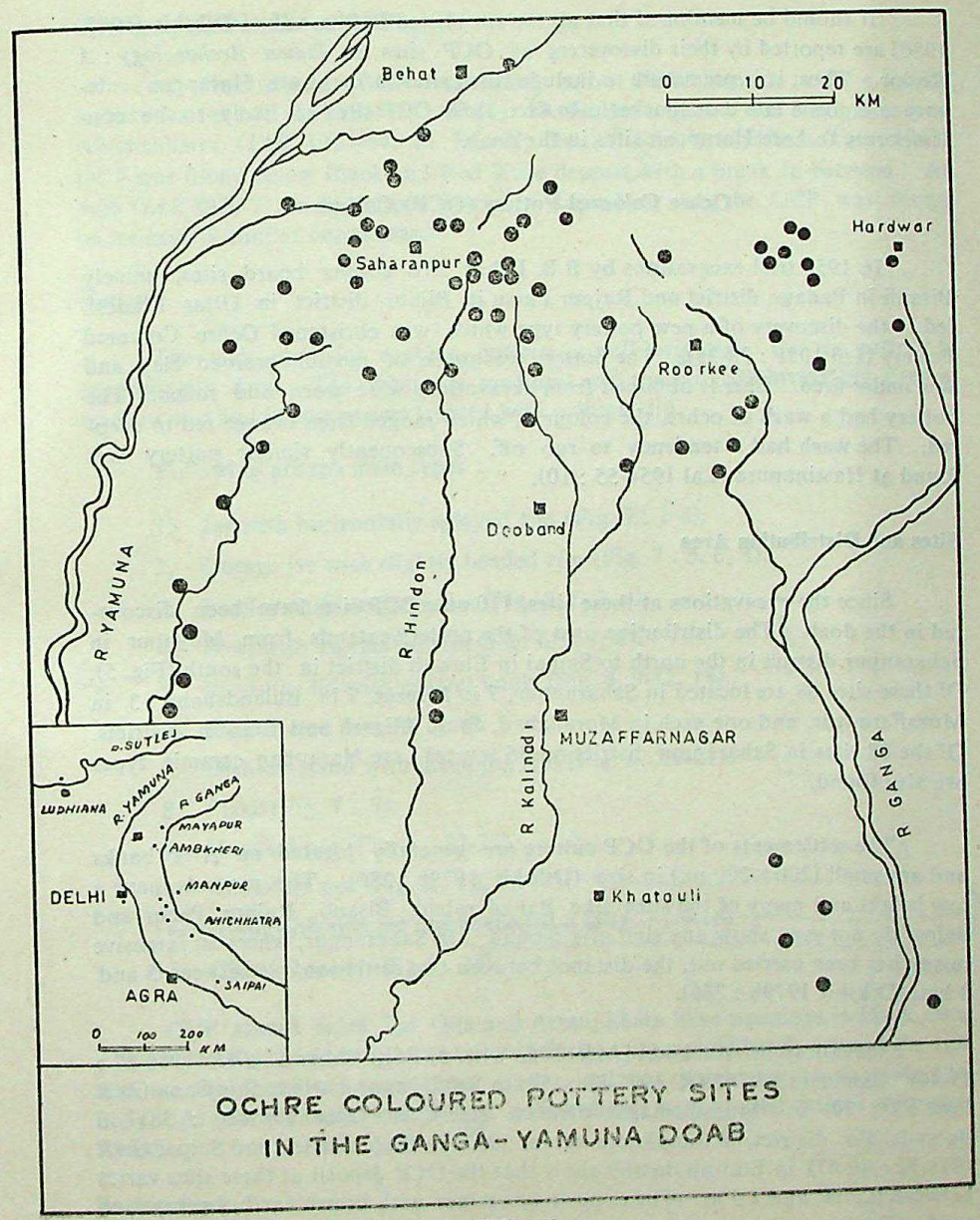

FIG. : 5.

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It should be mentioned that all the sites listed in Phase II of Dikshit (1977, 1980) are reported by their discoverers as OCP sites in *Indian Archaeology : A Review*. Thus, it is premature to include these sites in the Late Harappan category and give a late date bracket. In fact, these OCP sites are likely to be contemporary to Late Harappan sites in the doab.

Ochre Coloured Pottery (OCP) Culture

In 1950 trial excavations by B.B. Lal at two copper hoard sites, namely Bisauli in Badaun district and Rajpur Parsu in Bijnor district in Uttar Pradesh led to the discovery of a new pottery type which was christened Ochre Coloured Pottery (Lal 1951 : 38-39). The pottery was made of medium-grained clay and was under-fired. Sherds obtained from excavations were worn and rolled. The pottery had a wash of ochre, the colour of which ranged from orange-red to deep-red. The wash had a tendency to rub off. Subsequently similar pottery was found at Hastinapura (Lal 1954-55 : 10).

Sites and Distribution Area

Since the excavations at these sites, 110 new OCP sites have been discovered in the doab. The distribution area of the pottery extends from Mayapur in Saharanpur district in the north to Saipai in Etawah district in the south (Fig. 5). Of these sites 88 are located in Saharanpur, 7 in Meerut, 7 in Bulandshahr, 3 in Muzaffarnagar, and one each in Moradabad, Etah, Aligarh and Etawah districts. Of the 88 sites in Saharanpur district on 36 several Late Harappan ceramic types are also found.

The settlements of the OCP culture are generally located on river banks and are small (200×200 m.) in size (Dikshit 1979b : 286). The mounds have a low height and many of the sites like Bahadarabad, Bisauli, Rajpur Parsu and Saipai do not even show any sign of a mound. In Saharanpur, where an intensive survey has been carried out, the distance between two settlements is between 5 and 8 km. (Dikshit 1979b : 286).

Excavations at Ambkheri (*IAR* 1963-64 : 53-55), Baheria (*IAR* 1966-67 : 43-44), Bahadarabad (*IAR* 1971-72 : 54) in Saharanpur district, Jhinjhana (*IAR* 1962-63 : 70) in Muzaffarnagar district, Lal Qila (*IRA* 1969-70 : 38) in Bulandshahr district, Atranjikhera (Ghur 1967) in Etah district, and Saipai (*IAR* 1971-72 : 46-47) in Etawah district show that the OCP deposit at these sites varies between 0.5 m. and 1.5 m. The deposit was mixed with brown earth, *kankar* and sand. During excavation it generally came out in lumps. The strata was quite disturbed and no sign of regular habitation was encountered at any of these sites. The cultural material was found sporadically. In the case of Bahadarabad the occupational debris was found below a 6.5 m. deposit of sand, pebble and earth.

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Stratigraphic Position of OCP

At Hastinapura OCP was found below PGW deposit with a break in-between the two (Lal 1954-55 : 10-11). A similar sequence was encountered at Ahichchhatra (*IAR* 1963-64) in Bareilly district. At Atranjikhera (Gaur 1967) OCP was found below Black-and-Red Ware deposit with a break in-between. At Noh (*IAR* 1970-71) in Bharatpur district of Rajasthan, also, the OCP was found under exactly similar conditions.

Pottery

The clay used for making pottery is well levigated. But the pottery is inadequately fired. The fabric is medium and the pots are invariably given a wash or slip and in some cases treated with a thick slip.

Following are the main types :

1. Jar with horizontally splayed rim (Fig. 7 . 1-4).
2. Storage jar with slightly beaded rim (Fig. 7 . 5, 6, 8).
3. Bowl with featureless rim (Fig. 6. 1, 2, 6).
4. Bowl with an everted rim (Fig. 6. 5, 7, 8).
5. Bowl-like lid with central knob (Fig. 6. 9-11, 14).
6. Ring-footed bowl (Fig. 4).
7. Dish-on-stand with drooping rim (Fig. 6 . 19-21).
8. Flask (Fig. 7 . 7).
9. Handled pot (Fig. 6 . 22-23).
10. Miniature pot (Fig. 6 . 12, 15-18).
11. Basin with splayed out beaded rim (Fig. 7 . 9-16).
12. Channel spout (Fig 6 . 24).

OCP sherds from Lal Qila and Atranjikhera have paintings in black on a red surface (Fig. 7 . 2, 5, 6). The painted designs are simple bands around the rim and on the shoulder, wavy lines, circles, and mat designs on the shoulder and body. At Atranjikhera and Saipai a few sherds with incised designs were also found.

Architecture

Evidence for structural activities comes only from Lal Qila and is very scanty (Gaur 1967). No complete house plan is known. Floors were made by ramming the earth. The use of mud bricks and burnt bricks is evident

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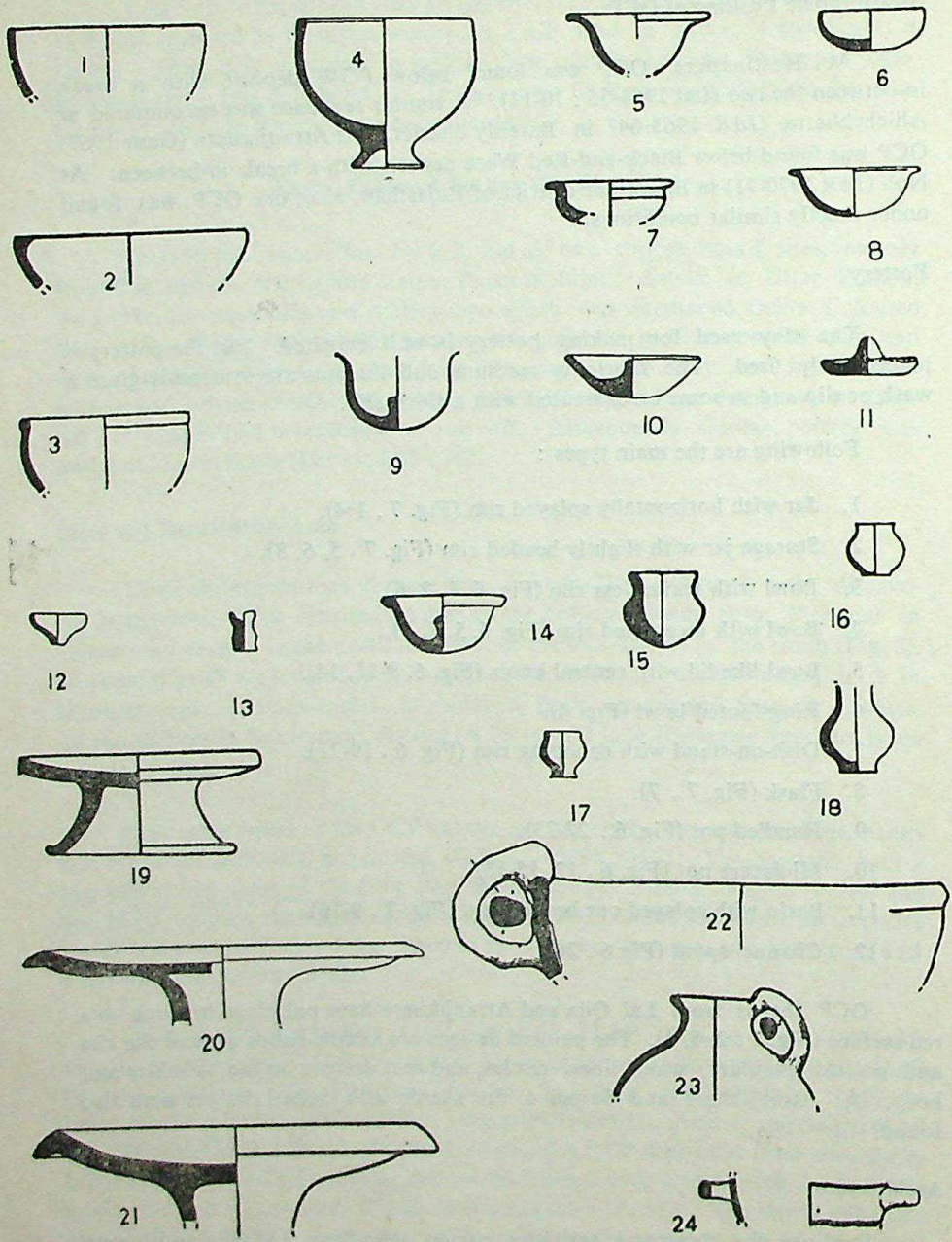

FIG. : 6.

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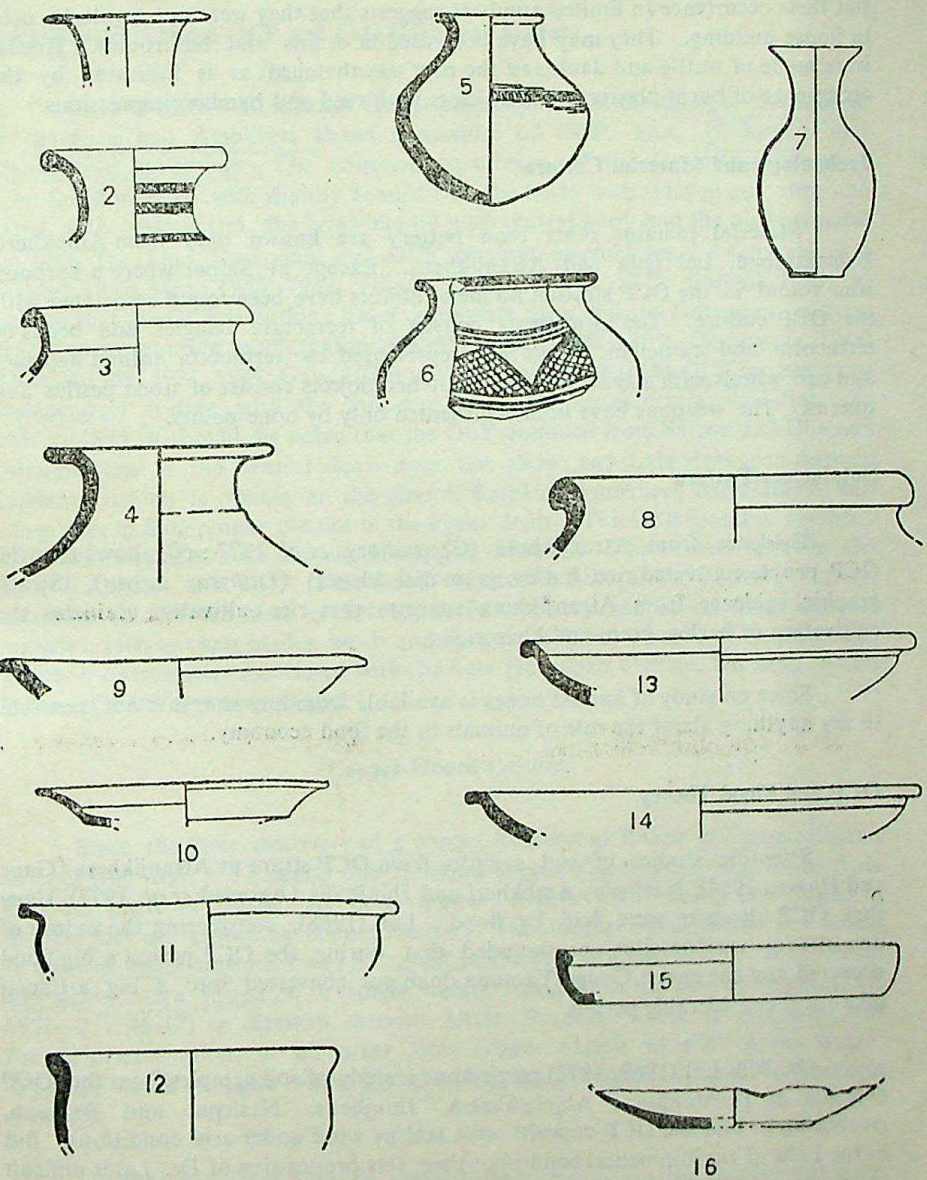

FIG. : 7.

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but their occurrence in limited numbers suggests that they were not regularly used in house building. They may have been used in drains and bathrooms. Houses were made of wattle and daub and the roof was thatched as is indicated by the occurrence of burnt plaster and mud clots with reed and bamboo impressions.

Technology and Material Culture

Material remains other than pottery are known only from Ambkheri, Bahadarabad, Lal Qila and Atranjikhera. Except at Saipai where a harpoon was found in the OCP stratum no metal objects have been found associated with the OCP culture. The ornaments consist of terracotta bangles and beads of terracotta and carnelian. Toys are represented by terracotta animal figurines and cart wheels with a central knob. Kitchen objects consist of stone pestles and querns. The weapons have been represented only by bone points.

Subsistence Pattern

Evidence from Atranjikhera (Chowdhury *et al.* 1977 : 60) shows that the OCP people cultivated rice, barley, gram and khaseri (*Lathyrus sativus*). Stratigraphic evidence from Atranjikhera suggests that rice cultivation antidates the cultivation of barley, gram and khaseri.

Since no study of animal bones is available from any site, it is not possible to say anything about the role of animals in the food economy.

OCP and Flood Theory

Scientific studies of soil samples from OCP strata at Atranjikhera (Gaur and Hassan 1964), Nasirpur, Ambkheri and Jhinjhana (Agrawal *et al.* 1977) show that OCP deposits were laid by flood. Lal (1968), considering the nature of deposits at various sites, propounded that during the OCP period a big flood occurred and the entire Ganga-Yamuna doab got converted into a big artificial lake for a considerable period.

Dr. B.B. Lal (1969, 1972) carried out a study of soil samples from the OCP deposits at Hastinapura, Ahichchhatra, Jhinjhana, Nasirpur and Bargaon. According to him the OCP deposits were laid by wind under arid conditions. But in the light of environmental conditions then, this proposition of Dr. Lal is difficult to accept. According to the pollen data from Hastinapura (Lal 1954-55 : 133-34) and wood fibre analysis from Atranjikhera (Chowdhury *et al.* 1977 : 63) the doab was then a dense mansoonal forest. It is difficult to reconcile aridity with forest environment. The archaeological and literary evidence also goes against the aridity theory.

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Relationship Between OCP and Late Harappan Culture

In 1964 M.N. Deshpande (1965) pointed out that the ceramic assemblage at Bargaon and Ambkheri shows a mixture of OCP, Late Harappan and Cemetery-H traditions. The common occurrence of the jar with splayed out rim, the storage jar with slightly beaded rim, the basin with splayed out rim, the bowl with everted rim, the bowl-like lid with central knob and the dish-on-stand in both the Late Harappan and OCP ceramic assemblages, led some scholars (Ghosh 1969; Misra 1965, 1982; Handa 1968; Sharma 1979; Possehl 1980) to believe that the OCP is nothing but a degenerate form of Late Harappan pottery. But another group of scholars (Lal 1954-55, 1968; Gupta 1963; Deshpande 1968; Dikshit 1969, 1971, 1979; Gaur 1970) is of the opinion that the OCP represents an independent culture with the influence of the Harappan ceramic tradition. In this context it should be noted that the OCP obtained from Saipai, Lal Qila and Atranjikhera in the central doab does not show any Late Harappan ceramic influence which is visible at the sites of Bargaon, Ambkheri, Bahadarabad and other sites in Saharanpur district in the upper doab. The OCP found in northern Rajasthan also does not show any Harappan influence. The contact between the Late Harappan and OCP is confined only to the Saharanpur district. It may, however, be clarified that except for a few pottery shapes no other cultural material, such as chert blades, beads and bangles of faience, beads of steatite and copper-bronze objects associated with the Late Harappan Culture, has been found in the OCP cultural assemblage.

Copper-Hoard Culture

Since the first discovery of a copper harpoon at Bithur in Kanpur district in 1822 (*Ms. Res.* p. 3), nearly one thousand copper objects have been found from different parts of India. As these copper objects have mostly been found in hoards, they are known as 'copper hoards'. The number of copper objects found in a hoard varies between 1 and 47 except in the case of Gungeria, in M.P. where 424 pieces were found in a single hoard. Except in the case of Saipai, (*IAR* 1971-72 : 46-47) in Etawah district, Uttar Pradesh where a harpoon was found in excavation, at all other sites copper objects of the 'copper hoard' typology came to light while ploughing a field, digging a canal or making a road.

In 1951 Lal listed 34 copper hoard sites. Since then the number has gone up to 86. Of these 5 sites came from Haryana, 6 from Rajasthan, 33 from U.P., 19 from Bihar, 6 from West Bengal, 7 from Orissa, 8 from Madhya Pradesh and 1 from Karnataka (Fig. 8). The total number of objects from these sites is 959. This figure does not include objects from Kiratpur, Chandausi, and Pariar as the exact number is not known (Table 1).

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Table 1. List of Sites of Copper Hoards and

S. No.	Locality	District & State	Copper Hoard					
			Flat celt	*Shouldered celt*	*Bar celt*	*Hatchet or Parsu*	*Double edged axe*	*Ring*
1.	Chandigarh	District H.Q., Haryana.	—	—	—	—	—	4
2.	Dadri	Mahendragarh, Haryana.	1	—	—	—	—	—
3.	Mitathal	Hissar, Haryana.	1	—	—	1 (?)	—	1
4.	Pauli	Jind, Haryana.	—	—	—	—	—	7
5.	Rewari	Gurgaon, Haryana.	4	—	—	—	—	—
6.	Bahadarabad	Saharanpur, U.P.	6	1	—	—	—	1
7.	Baheria	Shahjahanpur, U.P.	—	—	—	—	—	—
8.	Balua	Varanasi, U.P.	—	4	—	—	—	—
9.	Bargaon	Saharanpur, U.P.	—	—	—	—	—	2
10.	Bisauli	Badaun, U.P.	1	—	—	—	—	—
11.	Bithur	Kanpur, U.P.	29	7	—	—	—	—
12.	Chandausi	Moradabad, U.P.	—	—	—	—	—	—
13.	Deoti	Lucknow, U.P.	1	—	—	—	—	—
14.	Dhaka	Shahjahanpur, U.P.	—	5	—	—	—	—
15.	Fatehgarh	Farrukhabad, U.P.	—	—	—	—	—	—
16.	Gandhauli	Sitapur, U.P.	6	3	—	—	—	—
17.	Hardi	Sitapur, U.P.	1	—	—	—	—	—
18.	Indilapur	Saharanpur, U.P.	1	—	—	—	—	—
19.	Kamalpur	Hardoi, U.P.	1	—	—	—	—	—
20.	Kiratpur	Bulandshahr, U.P.	2	—	—	—	—	Several

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Copper-Bronze Implements of Protohistoric India

Types				*Place where lodged*	*Reference*
Anthropomorphic figure	*Harpoon*	*Antennae sword*	*Hooked sword*		
—	—	—	—		*IAR* 1970-71 : 7-8.
—	—	—	—	State Museum of Archaeology, Jhajjahar, Haryana.	Gupta 1971.
—	2	—	—	State Museum of Archaeology, Jhajjahar, Haryana.	Suraj Bhan 1969 :1-5.
—	—	—	—	State Museum of Archaeology, Jhajjahar, Haryana.	Dikshit 1968 : 49.
—	—	—	—	State Museum of Archaeology, Jhajjahar, Haryana.	Dikshit 1968 : 49.
—	—	—	1	—	Lal 1953 : 91.
—	1	1	1	Kausambi Museum, Allahabad.	*IAR* 1966-67 : 43-44; Sharma 1971-72 : 42-43.
—	—	—	—	Bharat Kala Bhawan Varanasi.	Dikshit 1968 : 50.
—	—	—	—		*IAR* 1963-64 : 57.
3	1	—	—	One Anthropomorphic figure in Municipal Museum, Allahabad; the rest in Bharat Kala Bhawan, Banaras.	Piggott 1944 : 182; Lal 1951 : 24-26.
—	10	1	—	Indian Museum, Calcutta; State Museum, Lucknow; Municipal Museum, Allahabad and Local Temples.	*As. Res.* 1882 : 3; Anderson 1883 : 395; Smith 1905 : 232 and 1907 : 53; Shastri 1915 : 1-6; Lal 1951 : 24; Lal 1979.
1	—	Several	—	Sanskrit University, Varanasi; National Museum, New Delhi; Municipal Museum, Allahabad.	*IAR* 1966-67 : 81; Dikshit 1968 : 50.
—	—	—	—	State Museum, Lucknow.	Lal 1951 : 29.
—	—	—	—	State Museum, Lucknow.	Lal 1951 : 27-28.
1	—	13	—	Indian Museum, Calcutta; National Museum of Antiquities, Edinburgh.	*As. Res.* 1832 : 624; Anderson 1883 : 405-408; Smith 1905 : 232.
—	—	—	—	State Museum, Calcutta Lucknow; Personal Collection of Misra Bandhu of Gandhauli.	*IAR* 1956-57 : 74, 1969-70 : 38; Dikshit 1968: 50; Thaplyal and Shukla 1972 : 98.
—	—	—	—	State Museum, Lucknow.	Lal 1951 : 27.
—	—	—	—	State Museum, Lucknow.	Lal 1951 : 29.
—	—	—	—	State Museum, Lucknow.	Shastri 1915 : 4.
1	—	—	—	—	*IAR* 1969-70 : 38.

(*Contd. on next page*

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S. No.	Locality	District & State	Copper Hoard					
			Flat celt	Shouldered celt	Bar celt	Hatchet or Parsu	Double edged axe	Ring
21.	Kausambi	Allahabad, U.P.	1	—	—	—	—	—
22.	Madanapur	Hardoi, U.P.	1	9	—	—	—	—
23.	Mainpuri	District H.Q., U.P.	2	—	—	—	—	6
24.	Majhadpur	Hardoi, U.P.	1	—	—	—	—	—
25.	Manpur	Bulandshahr, U.P.	1	1	—	—	—	—
26.	Mathura	District H.Q., U.P.	1	—	—	—	—	—
27.	Nakarahiya	Sitapur, U.P.	—	4	—	—	—	—
28.	Nasirpur	Shahjahanpur, U.P.	2	2	2	—	—	—
29.	Niorai	Etawah, U.P.	—	—	—	—	—	—
30.	Pariar	Unnao, U.P.	1	1	—	—	—	—
31.	Rajpur Parsu	Bijnor, U.P.	9	—	1	—	—	—
32.	Sadabad	Mathura, U.P.	16	—	—	—	—	—
33.	Sahabad	Hardoi, U.P.	4	1	—	—	—	—
34.	Saipai	Etah, U.P.	—	—	—	—	—	—
35.	Sarthauli	Shahjahanpur, U.P.	—	—	—	1	—	—
36.	Sheorajpur	Kanpur, U.P.	—	—	—	—	—	—
37.	?	Hardoi, U.P.	1	—	—	—	—	—
38.	?	Etawa, U.P.	—	—	—	—	—	—
39.	Elana		1	—	—	—	—	—
40.	Khardi	Nagaur, Rajasthan.	7	—	1	—	—	—
41.	Nandlalpura	Jaipur, Rajasthan.	—	—	6	—	—	—
42.	Padaliya	Chittorgarh, Rajasthan.	6	—	—	—	—	—
43.	Savarniya	Bikaner, Rajasthan.	2	—	—	—	—	—
44.	Ganeswar	Sikar, Rajasthan.	58	—	—	—	—	—
45.	Balpur	Bilaspur, M.P.	2	—	—	—	—	—
46.	Dabakia	Jabalpur, M.P.	—	—	1	—	—	—
47.	Gungeria	Balaghat, M.P.	Several	Several	Several	—	—	—

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Types				*Place where lodged*	*Referenee*
Anthropomorphic figure	*Harpoon*	*Antennae sword*	*Hooked sword*		
—	—	—	—	British Museum, London.	Smith 1905 : 232.
—	—	—	—	Deccan College, Pune.	Misra 1976.
—	—	—	—	Indian Museum, Calcutta.	*P.A.S.B.* 1968 : 251-62 Anderson 1883 : 403.
—	—	—	—	State Museum, Lucknow.	Lal 1951 : 29.
—	—	—	1	State Museum, Lucknow.	Shastri 1915 : 4.
—	—	—	—	—	Cunningham : 16.
—	—	—	—	State Museum, Lucknow.	Dikshit 1968 : 50.
—	1	—	2	Gurukul Kangari Museum, Hardwar.	Dikshit 1968 : 47.
—	1	—	1	Royal Society of Antiquaries, Copenhagan.	*PSAS* 1870 : 293, 300; Anderson 1883 : 396.
—	Several	—	—	Local temples.	Fuhrer 1891 : 168; Smith 1907 : 53.
—	6	—	—	State Museum, Lucknow.	Smith 1905 : 231, 234.
—	—	—	—	State Museum, Lucknow.	Srivastava 1973 : 41.
—	4	1	1	National Museum, New Delhi.	*IAR* 1966-67 : 81; Gupta 1965 : 2-3.
1	1	—	2	—	*IAR* 1970-71 : 38; Lal 1971-72 : 47.
—	1	—	5	State Museum, Lucknow.	Lal 1951 : 28-29.
3	—	—	—	State Museum, Lucknow.	*Ibid.* p. 29.
—	—	—	—	—	Gupta 1971.
—	1	—	—	British Museum, London.	*Ibid.*
—	—	—	—	Directorate of Archaeology of Museums, Govt. of Rajasthan.	Agrawal 1979.
—	—	—	—	Jodhpur Museum, Jodhpur.	*IAR* 1960-61 : 69.
—	—	—	—	Dept. of Archaeology, Rajasthan.	Parmar 1977 : 63-64.
—	—	—	—	Dept. of Archaeology, Rajasthan.	Times of India dated 27.8.1977; Agrawal 1979 : 91.
—	—	—	—	State Museum of Archaeology, Jhajjhar, Haryana.	Dikshit, 1968 : 49; Gupta 1971; *IAR* 1968-69 : 69.
—	—	—	—	Department of Archaeology, Rajasthan.	Agrawal 1978 : 123.
—	—	—	—	Personal collection of Sri Pandey Lochan Sharma of Bilapur village.	Gordon 1958 : 142.
—	—	—	—	—	*IAR* 1961-62 : 99.
—	—	—	—	Indian Museum, Calcutta; National Museum, Dublin;	*PASB* 1970 : 131; Anderson 1883 : 414-25; Reed 1920:

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S. No.	Locality	District & State	Copper Hoard					
			Flat celt	Shouldered celt	Bar celt	Hatchet or Parsu	Double edged axe	Ring
48.	Kelsi	Sagar, M.P.	3	—	—	—	—	—
49.	Pondi	Rewa, M.P.	5	—	—	—	—	47
50.	Ramjipura	Nimar, M.P.	1	—	—	—	—	—
51.	?	Jabalpur, M.P.	1	—	—	—	—	—
52.	?	Chhota Nagpur, M.P.	1	—	—	—	—	—
53.	Andheri	Singhbhum, Bihar.	—	6	—	—	—	—
54.	Bandua	Ranchi, Bihar.	1	—	—	—	—	—
55.	Bargunda	Hazaribagh, Bihar.	1	—	—	—	—	1
56.	Bartola	Ranchi, Bihar.	21	—	—	—	—	—
57.	Bichana	Ranchi, Bihar.	1	—	—	—	—	—
58.	Bordogaon	Singhbhum, Bihar.	—	3	—	—	—	—
59.	Cl adsai	Santhal Pargana, Bihar.	—	2	—	—	—	—
60.	Dargama	Ranchi, Bihar.	5	—	—	—	—	—
61.	Hami	Palamau, Bihar.	6	—	17	—	—	—
62.	Kaharbari	Hazaribagh, Bihar.	—	3	—	—	—	—
63.	Kamdera	Ranchi, Bihar.	2	—	—	—	—	—
64.	Kaushaya	Monghyr, Bihar.	—	1	—	—	—	—
65.	Kera	Singhbhum, Bihar.	—	1	—	—	—	—
66.	Kolabarty	Dhanbad, Bihar.	—	6	—	—	—	—
67.	Saguna	Palamau, Bihar.	1	—	—	—	—	—
68.	?	Hazaribagh, Bihar.	3	—	—	—	—	—
69.	Various	Manbhum, Bihar.	27	—	—	—	—	—
70.	?	Ranchi, Bihar.	2	—	—	—	—	—
71.	?	Ranchi, Bihar.	2	—	—	—	—	—
72.	Chatla	Midnapur, West Bengal.	—	1	—	—	—	—
73.	Kulghera	Purulia, West Bengal.	—	3	—	—	—	—

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Types				Place where lodged	Reference
Anthropomorphic figure	Harpoon	Antennae sword	Hooked sword		
				British Museum, London; National Museum of Antiquities, Edinburgh.	182-83; Smith 1905 : 233 ff.
—	—	—	—	Central Museum, Nagpur.	Gupta 1971.
—	—	—	—	Municipal Museum Allahabad; Office of the Superintendent of Archaeology, Vindhya Pradesh.	Lal 1951 : 22-23.
—	—	—	—	—	*IAR* 1962-63 : 99; Krishna 1966 : 197.
—	—	—	—	—	*PSAS* 1874 : 691.
—	—	—	—	Patna Museum, Patna.	Gupta 1971.
—	—	—	—	Patna Museum, Patna.	*Ibid.*
—	—	—	—	Patna Museum, Patna.	*Ibid.*
—	—	—	—	Madras Government Museum, Madras.	Foote 1916 : 164.
—	—	—	—	Patna Museum, Patna.	Coggin-Brown 1915 : 127-28.
—	—	—	—	Patna Museum, Patna.	Roy 1915 : 422
—	—	—	—	Patna Museum, Patna.	Gupta 1965 : 68-77; Dikshit 1968 : 50.
—	—	—	—	Patna Museum, Patna.	Gupta 1971
—	—	—	—	Patna Museum, Patna.	Roy 1915 : 239.
—	—	—	—	Patna Museum, Patna.	Roy 1916 : 482-83.
—	—	—	—	Patna Museum, Patna.	Gupta 1971.
—	—	—	—	Patna Museum, Patna.	*Ibid.*
—	—	—	—	Indian Museum, Calcutta.	Mukharjee, 1935 : 517 ff.
—	—	—	—	Patna Museum, Patna.	Gupta 1971.
1	—	—	—	Patna Museum, Patna and State Museum, Lucknow.	*Ibid.*
—	—	—	—	Patna Museum, Patna and State Museum, Lucknow.	Coggin-Brown 1915 : 125-26.
—	—	—	—	Indian Museum, Calcutta.	*PASB* 1871 : 231; Anderson 1883 : 392-95.
—	—	—	—	Indian Museum, Calcutta.	Campbell 1916 : 392-95.
—	—	—	—	Patna Museum.	Gupta 1971.
—	—	—	—	Patna Museum.	Gupta 1971
—	—	—	—	Dept. of Archaeology, West Bengal.	*IAR* 1965-66 : 68.
—	—	—	—	Directorate of Archaeology, Govt. of West Bengal.	*IAR* 1971-72 : 51.

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S. No.	Locality	District & State	Copper Hoard					
			Flat celt	*Shouldered celt*	*Bar celt*	*Hatchet or Parsu*	*Double edged axe*	*Ring*
74.	Tamajuri	Midnapur, West Bengal.	—	1	—	—	—	—
75.	Bhangarapir	Mayurbhanj, Orissa.	—	1	—	—	3	—
76.	Dunria	Pal Lahara, Orissa.	—	3	—	—	—	—
77.	?	?	—	—	—	—	—	—
78.	Agavibani	Midnapore, West Bengal.	—	2 2 celt fragments 4 unfinished celts	—	—	—	11
79.	Kallur	Raichur, Karnataka.	2	—	—	—	—	—
80.	Parihati	Midnapore, West Bengal.	—	—	1	—	5	—
81.	Bhaktabandh	Bankura, West Bengal.	—	2	—	—	—	—
82.	Khiching	Mayurbhanj, Orissa.	—	2	—	—	—	—
83.	Kshetra	Mayurbhanj, Orissa.	—	—	1	—	—	—
84.	Baghada	Mayurbhanj, Orissa.	—	—	—	—	1	—
85.	?	Mayurbhanj, Orissa.	—	2	—	—	—	—
86.	?	Mayurbhanj, Orissa.	—	1	—	—	—	—

Types				Place where lodged	Reference
Anthropomorphic figure	*Harpoon*	*Antennae sword*	*Hooked sword*		
—	—	—	—	Indian Museum, Calcutta.	Anderson 1883 : 485-86; Smith 1905 : 5.
—	—	—	—	Shouldered celt in Patna Museum, Double axe, one each in State Museum, Lucknow.	Goggin-Brown 1916 : 386-87; Gupta 1971.
—	—	—	—	State Museum, Lucknow; Patna Museum, Patna.	Gupta 1971; Lal 1951 : 29.
1	—	—	—	Brooklyn Museum, U.S.A.	Chakrabarty 1977 : 68.
—	—	—	—	Dept. of Archaeology, West Bengal.	Times of India Dec. 3, 1976.
—	—	3	—	Hyderabad Museum, Hyderabad.	Annual Rep. Arch. Dept. of H.E.H. The Nizam's Dominion for 1937-40 (Calcutta 1942), pp. 22-24.
—	—	—	—	Dept. of Archaeology, Calcutta. University, Calcutta, Directorate	Nag and Chakrabarty 1980 : 97-100.
—	—	—	—	of Archaeology, Govt. of West Bengal.	Nag and Chakrabarty 1980: 97-100.
—	—	—	—	Baripada Museum, Orissa.	Mohapatra 1964 : 45-47.
—	—	—	—	Baripada Museum, Orissa.	Mohapatra 1964 : 54-47.
—	—	—	—	Baripada Museum, Orissa.	Mohapatra 1964 : 45-47.
—	—	—	—	Baripada Museum, Orissa.	Mohapatra 1964 : 45-47.
—	—	—	—	Baripada Museum, Orissa.	Mohapatra 1964 : 45-47.

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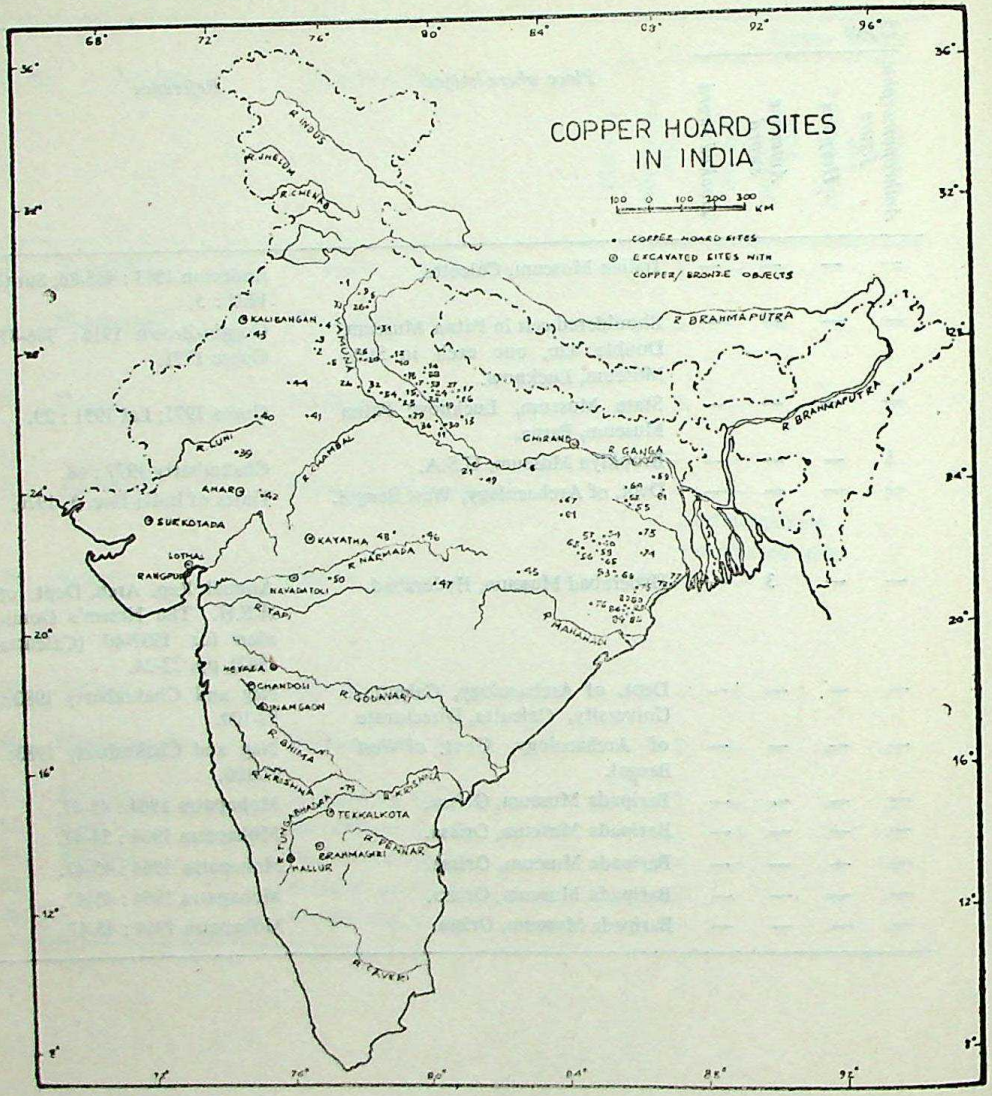

FIG. : 8.

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Main Types and Their Probable Use

1. Celts

Celts are of three types :

(*a*) *Flat Celts* : Flat celts are usually sub-rectangular and have an edge at one end (Fig. 9.7). These are 10 to 26 cm. in length and 8 to 18 cm. in breadth. In all, 255 flat celts have been found from 48 sites. Of these 6 come from 3 sites in Haryana, 88 from 21 sites in U.P., 74 from 5 sites in Rajasthan, 13 from 5 sites in M.P., 72 from 12 sites in Bihar and 2 from 1 site in Karnataka. From West Bengal and Orissa no flat celts have been reported.

(*b*) *Shouldered Celts* : Shouldered celts have a clear kink or setback at the point where the curved edge meets the main body of the celt (Fig. 9. 8). These are 20 to 23 cm. in length and 14-23 cm. in breadth. In all, 84 shouldered celts have been found from 28 sites. Of these 38 celts come from 11 sites in U.P., 22 from 7 sites in Bihar, 15 from 5 sites in West Bengal and 9 from 5 sites in Orissa. The shouldered celts have a south-easterly distribution. Their main distribution is in Bihar, Orissa and West Bengal. These have not been found west of the doab.

(*c*) *Bar Celts* : Bar celts consist of nearly parallel sided bars with a crescentic cutting edge (Fig. 9. 6). These are 50-60 cm. long and 4 to 8 cm. wide. A total of 30 bar celts have been found from 8 sites. Of these 3 celts come from 2 sites in U. P., 7 from 2 sites in Rajasthan, 17 from 1 site in Bihar and 1 each from M.P., Orissa and West Bengal.

These three types of celts show a flat ventral and slightly convex dorsal side. The flat and shouldered celts were probably used for cutting wood and for hunting animals. On the basis of use marks on the edge Agrawal (1971 : 198) suggests that bar celts were used for mining ores.

A study of 12 celts (flat and shouldered type) by Thaplyal and Shukla (1974) and Lal (1979) shows that celts have regular depression marks (varying in number) on one surface. Thaplyal and Shukla (1974) suggest that these depression marks may be the trade mark of smiths.

Rings

Rings are made by bending a circular rod till the ends meet (Fig. 9. 2). A to al of 80 rings have been found from 9 sites. Of these 12 rings come from 3 sites in Haryana, 9 from 3 sites in U.P., 47 from 1 site in M.P., 1 from Bihar and 11 from 1 site in West Bengal. The rings from Pondi, Rewa district, M.P. are different because they are made from rods with a perfectly circular cross section. Pondi type rings have not been found at any other site.

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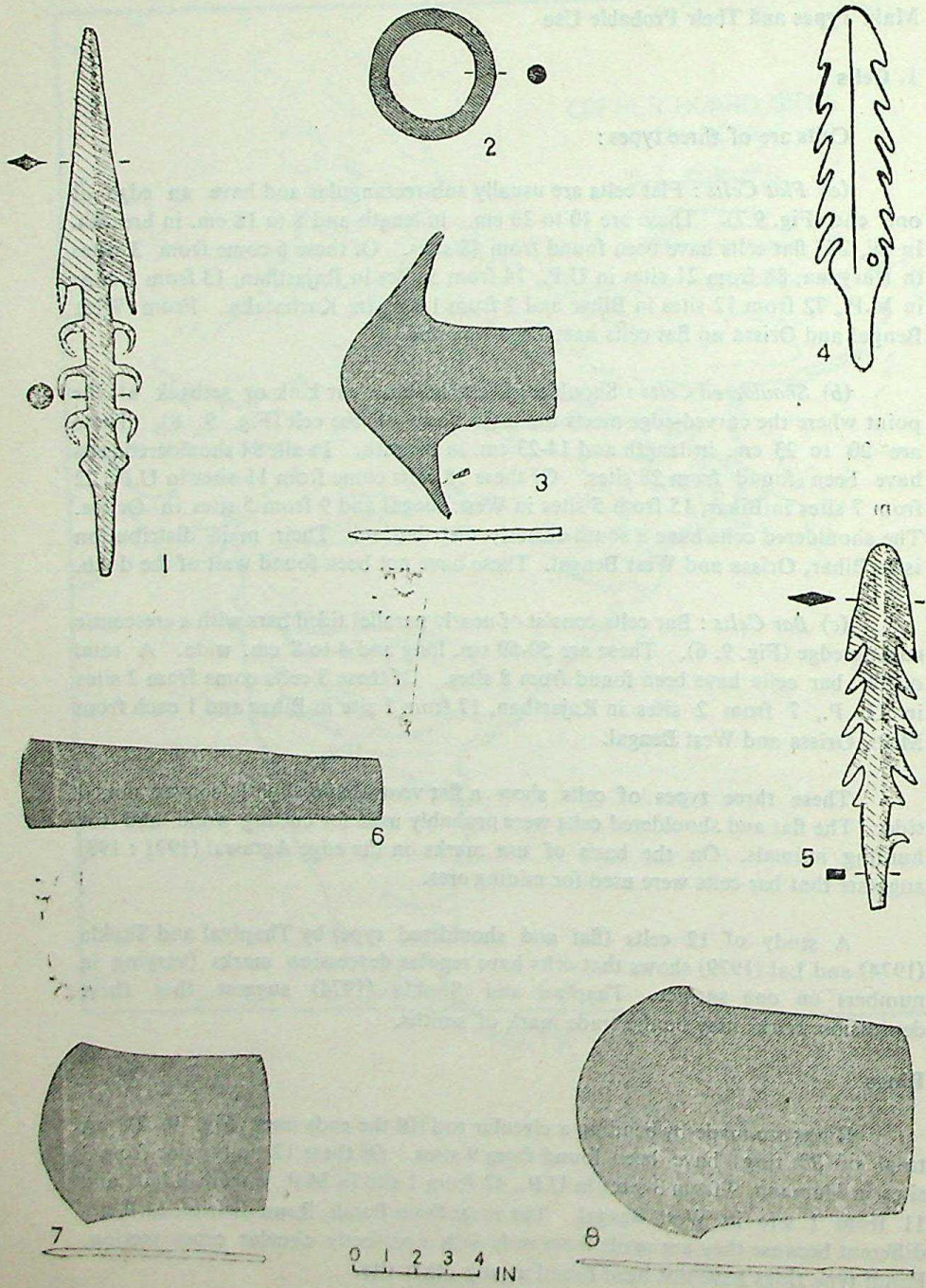

FIG. : 9.

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Smith (1905 : 238) suggested their use as currency, like Irish gold and silver ring money. Agrawal (1971 : 199) thinks that they were units of weight for smiths.

Harpoons

Harpoons are of two types :

Type 1 : They are cut from a thick sheet of copper and hammered. They have 4-6 oblique barbs on each side spaced equally on the two-thirds length of blade. Besides, they have a holed lug or forked hook on the stem (Fig. 9. 4). Two pieces from Bithur (Lal 1979) have three pairs of straight projections in place of the holed lug or forked hook (Pl. XIII. A. 1).

Type 2 : These are cast in double mould and have a long spear blade with generally two but sometimes three or four pairs of incurved barbs (Fig. 9. 5). They have a well developed mid rib and are superb examples of craftsmanship. One specimen from Bithur has three pairs of straight projections in place of the holed lug or forked projection (Pl. XIII. A. 2).

Total number of harpoons found so far is 29 from 11 sites. Outside Uttar Pradesh, only one harpoon has been found from Mitathal in Haryana. Since details of each harpoon are not available it is not possible to give the exact number of each type.

Antennae Swords

Antennae swords consist of a blade of 40-50 cm. in length and a hilt in one piece. The mid rib in the blade is quite prominent. The most remarkable feature of swords is the hilt which bifurcates like the antenna of an insect (Fig. 10. 2). Gupta (1965 : 5) says that there was a cover of wood, horn or bone of two pieces of 'T' shape over the hilt which was secured by thongs passing through holes on the blade.

So far 19 antennae swords have been found from 6 sites. Except for the site of Kallur in Raichur district, Karnataka, all other sites are located in western Uttar Pradesh.

Antennae swords imply a military element. They may have been used in killing game as well. Regarding their use, Agrawal (1971 : 199-200) says, "The antennae swords were used for killing or wounding big game by trapping. The advantage of antennae hilt will be that the swords can be fixed securely in narrow clefts made in heavy wooden logs. Such logs, with antennae swords projecting out, could be placed in the bottom of big pits. The pits could be camouflaged with leaves and twigs and big game would be stampeded towards the pits. The

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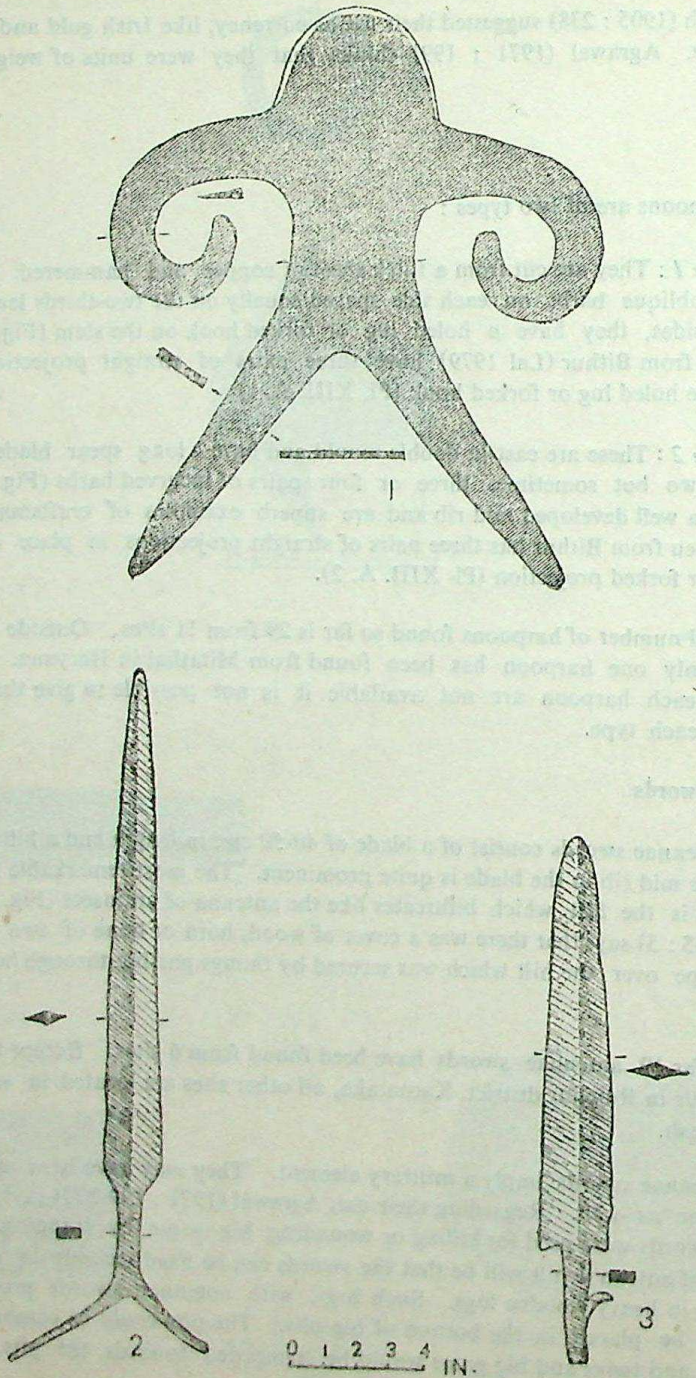

FIG. : 10.

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game would fall heavily on the projecting swords which would pierce it through without getting buckled or sunk in the ground with the weight. A straight hilt or tang will be buried into the ground under the heavy impact."

This conjectural explanation is not supported by any historical or contemporary examples.

Hooked Swords

Hooked swords are like antennae swords except that in place of antennae there is a forked hook on the stem (Fig. 10,3). So far 15 hooked swords have been from 9 sites, all in western Uttar Pradesh.

Anthropomorphs

Anthropomorphs are large and massive objects. The forearms are incurved and sharpened on the outer edge, and legs are plane. The arms are thinner than the head which was further thickened by beating the top (Fig. 10.1). The length of anthropomorphs varies between 25 and 45 cm. and breadth between 30 and 43 cm. In all cases except one, the length of the anthropomorph is more than its breadth. Only in the case of the Bisauli example the breadth is 33.5 cm. whereas the length is 22.5 cm.

There are only 13 known anthropomorphs. Eleven of them came from 7 localities in Uttar Pradesh. The locale of two pieces—one in Patna Museum (Gupta 1971) and one in Brooklyn Museum, U.S.A. (Chakrabarty 1977)—is not known.

Gordon (1958 : 137-38) suggested that anthropomorphs were used as weapons. To determine their function Agrawal (1971 : 200) made an imitation model and tried it as a missile. According to him, due to their thick head they whirl when in motion. He feels that these were used for killing flying birds. But seeing their massive size and weight (up to 5 kg.) their use as a missile seems quite improbable.

Tiny (from 4 to 10 cm.) anthropomorphic figurines resembling copper hoard specimens are worshipped in the Ganga-Yamuna doab region as God *Shani*. It is, therefore, quite possible that the copper hoard anthropomorphs were also objects of worship. In northeast Asia anthropomorphic figurines symbolize ancestors who are regarded as defenders of the race (Gupta 1965).

Double-Axes

These are made by cutting away almost circular pieces from the sides of an oval sheet. Only three specimens of double-axes are known. They come from Bhangarapir, Orissa. Of the three specimens, two have both ends sharpened while

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the third has only one end sharp. Gupta (1965 : 4) thinks that the oblong celt from Lothal, edgeless double-axe from Harappa and the triangular bladed axe from Hallur are connected with double-axes culturally and chronologically. However, morphologically, Bhangarapir axes are totally dissimilar from Lothal, Harappa and Hallur axes. Agrawal (1971 : 201) thinks that to call the Bhangarapir specimens axes is a complete misnomer.

Type Distribution of Copper Hoards

On the basis of its typology the copper hoard area can be divided into three zones.

Zone A

Zone A comprises Bihar, West Bengal and Orissa. This zone is characterised by the occurrence of (I) Flat celts, (II) Shouldered celts, (III) Bar celts, and (IV) Double-axes.

Zone B

Zone B comprises Uttar Pradesh and Haryana. In this type the finds are : (I) Anthropomorphs, (II) Antennae swords, (III) Hooked swords, and (IV) Harpoons, besides the types I, II and III of zone A.

Zone C

Zone C comprises Rajasthan. The type finds of this zone are : (I) Flat celts, and (II) Bar celts.

Technology of Copper Hoard Objects

Smith (1905) mentioned the result of the analysis of 4 objects—one celt from Jabalpur, one sword from Fatehgarh and two harpoons (locality not known). All these objects showed 3.38 to 13.3 per cent of tin. The Bisauli anthropomorph showed 0.66 per cent of nickel (Lal 1951 : 24). The chemical analysis of three celts from Bargunda (Gupta 1971) shows that one celt was of pure copper whereas two had one per cent of alloys (alloy metal not mentioned). Five objects (Shahabad celt, Shahabad fragmentary harpoon, Kamdera celt, Dhanbad celt and Dargama celt) were analysed by Agrawal (1971 : 171). These samples showed that they were made of pure copper.

Agrawal and his colleagues (Agrawal *et al.* 1974, 1978) carried out an analysis of 41 copper hoard objects. Of these 32 objects came from 12 sites in Uttar Pradesh and 9 from 5 sites in Bihar. Following is the number of different objects :

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Celts	: 33 (24 from Uttar Pradesh and 9 from Bihar)
Bangles	: 2 (from Uttar Pradesh)
Anthropomorphs	: 1 (from Uttar Pradesh)
Spear heads	: 2 (from Uttar Pradesh)
Harpoons	: 2 (from Uttar Pradesh)
Swords	: 2 (from Uttar Pradesh)

Atomic absorption spectrometric analysis of 27 objects from Uttar Pradesh shows traces of tin in all specimens whereas nickel 0.005 to 0.453%, iron 0.0 37 to 0.4768%, arsenic 0.1361 to 7.844% and lead 0.0038 to 2.432% are present (Agrawal *et al.* 1978 : Table 1). Alloying of arsenic was deliberate. The closed casting of pure copper is quite difficult and harpoons and swords show that their casting was done in closed moulds. Arsenic was added to facilitate casting and make the metal hard.

A comparative study of impurity patterns of copper hoard objects from U.P. and Bihar has been carried out by Agrawal *et al.* (1978 : 43, Table 2 & 3). On the basis of the presence of iron, antimony, nickel, manganese, cobalt, alluminium and chromium and absence of gold, wolfram, titanium, vanadium, and phosphorus in copper hoard objects and Rakha ores they concluded that the source of metal for the Uttar Pradesh copper hoard were Rakha ore mines. But in spectrophotometry analysis not a single object from Uttar Pradesh shows the presence of tin whereas it is present in Rakha ore (Agrawal *et al.* 1978 : Table 3).

Chemical analysis of 5 celts (Nos. 4, 6, 7, 8 and 9) from Madanapur, Hardoi district, U.P. (Misra 1976) were carried out by Thakkar (1977). The analysis shows that three celts (nos. 7, 8 and 9) have an identical impurity pattern. They contain lead, cadmium, bismuth, arsenic, antimony, iron, manganese and zinc as impurities. Celt no. 4 fails to show bismuth, arsenic, and antimony which are present in other three celts. In celt no. 6 lead, arsenic and antimony are absent. However, this is the only celt in which lead is absent but it shows the presence of tin. Celt nos. 4 and 6 show the presence of alluminium which is absent in celt nos. 7, 8 and 9. The impurity pattern of the last three celts shows that they belong to the same source.

When we compare the impurity patterns of above five celts with Rakha ores we find that in Rakha ores tin, silver and cobalt are present whereas these are absent in the celts. Bismuth is not present in the ores whereas it is present in the celts.

This comparative study of the chemical analysis of Rakha copper ores and copper hoard objects shows that Uttar Pradesh copper hoards do not belong to Rakha ores. The probability of Singhbhum or Khetri ore mines as the source for Uttar Pradesh copper hoards has already been excluded by Agrawal *et al.* (1978).

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What then may be the source of the copper hoards from Uttar Pradesh ? In zones A and C ores were available locally but in zone B there are no ores. So the manufacturer had to import the raw material from outside. Zones A and C could not be the source of the raw material. The nearest ore sources to zone B are the mines of the Kumaon-Garhwal region. The largest concentration of copper hoards in Uttar Pradesh is in the upper and central parts. It would be easier for the copper hoard smiths of zone B to obtain ore from the Kumaon-Garhwal region than to import it from Rajasthan and Bihar. But anything with certainty can be said only when a chemical analysis of the Kumaon-Garhwal ores is also available.

Metallurgy

Metallographic analysis of some objects shows that besides alloying, the copper hoard smith knew the process of annealing and coldwork (Agrawal *et al.* 1978 : 45-46). The objects were made both in open and closed moulds. Celts were generally cast in an open mould whereas swords and harpoons were cast in closed moulds.

Relationship Between Copper Hoards and Late Harappans, OCP, and Aryans

On the basis of typological analysis of copper hoards, celts and axes from Harappa and Mohenjodaro and similar objects found in Egypt, Sardinia, British Isles, Greece and Transcaucasia, Heine-Geldern (1936, 1956) propounded that the copper hoards belong to Aryans who came to India some time between 1200 and 1000 B.C. Lal (1951) in his detailed typological analysis and critical assessment of Heine-Geldern's view showed that none of the copper hoard types have been found in Egypt, Sardinia, Transcaucasia etc.

Piggott (1944) first supported the Aryan theory of Heine-Geldern but later changed his view and assigned the copper hoards to the Late Harappan people. He writes, "It would be tempting to associate this movement with something more than trade, and see in it the colonization of the Ganga basin by refugees and displaced persons from Panjab and Indus valley during the time of the breakup of the Harappa empire and the coming of Aryans from the west" : Piggott (1950 : 238). The discovery of copper hoard objects, OCP and Late Harappan pottery at Bahadarabad and a broken anthropomorphic figure from Lothal led Sharma (1962) to conclude that OCP and copper hoards were only the Late Phase of Harappan Culture.

The typological analysis of Harappan copper objects and those of copper hoards gives completely different pictures. The flat celts are the only common link between the two. The distinctive Harappan types are razor, arrowheads, barbed fish hooks, and curved blades whereas copper hoards are distinguished by harpoons, antennae swords, and anthropomorphs. The metal analysis of Harappan

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implements shows that tin was alloyed in copper from 1 to 23% whereas in copper hoards arsenic was alloyed from 0.13% to 7.84%. Wheeler (1959 : 125) also opined that there is no substantial evidence to support the view that the hoards represent a colonisation of the Ganga basin by refugees and displaced persons from Panjab and the Indus valley during the time of the break-up of Harappa empire and the coming of raiders from the west.

Dikshit (1968), however, believes that the mid-rib in harpoons and swords of copper hoards evolved due to the contact between Harappans and the copper hoard people living in Haryana, Uttar Pradesh and Rajasthan. He does not specify from which Harappan object the mid-rib in copper hoard objects evolved. But this theory cannot be sustained since only one copper hoard type, namely, the harpoon is known by a single example from the surface of the mound at Mitathal.

Before the excavation at Saipai, copper hoards were never found in a stratigraphic context. At copper hoard sites of Bahadarabad, Nasirpur, Rajpur Parsu, Baheria, Kiratpur and Bisauli, OCP was found.

Considering this evidence Lal (1951) associated copper hoards with OCP which was obtained from Hastinapura, Bisauli and Rajpur Parsu. From Saipai (*IAR* 1970-71 : 46-47) OCP and a copper harpoon were found together in stratified deposit. Lal assigned this ceramic tradition and copper hoards to the people who inhabited the doab before the arrival of Aryans. The area of the copper hoard distribution is, at present, known to have been occupied by Austro-Asiatic speaking Mundas, Santhalas and other tribes belonging to the Proto-Austroloid group of the Indian population which probably migrated to India from southeast Asia (Mukharji and Chakrabarty 1964). The Austro-Asiatic languages spoken in Burma and by Khasis in northeastern India would provide a clue to the route which the Mundas had taken on their migration to eastern and central India. It is also possible that eastern Austronesian tribes (forefathers of Mon Khmer and linguistically associated with the Mundas, Bongard-Levin 1957) independently developed the use of metal. Recent research shows that in Thailand the use of bronze started in 4th millennium B.C. and iron in the Middle of second millennium B.C. (Sohleim II 1978). North-eastern India has been considered as an integral part of southeast Asia during neolithic period (Gupta 1963). So in all probability the Mundas who migrated to India with the knowledge of metallurgy sometime between 3000-2000 B.C. were the creators of these hoards.

In Vedic literature, also, we find references about the Aryans encountering certain native tribes whom they called *nishadas*, with short statures and flat noses (*anas*.). Most probably these native tribes were the Mundas and other Austroloid tribes.

Black and Red Ware Culture

Though Black-and-Red Ware (BRW) was found in PGW assemblage at the

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sites of Ahichchhatra (Ghosh and Panigrahi 1946), Hastinapura (Lal 1954-55 : 11) and Alamgirpur (*IAR* 1958-59 : 50-55), its existence as an independent phase was unknown until the excavations at Atranjikhera in the early 1960s (Gaur 1967). Here, this pottery was found sandwiched between PGW and OCP cultural deposits. The BRW deposit at Atranjikhera was only 10-30 cm. thick. For this reason it was difficult to believe in the initial stage that the BRW represents an independent phase. But in the early 1970s excavations at Noh (*IAR* 1971-72 : 42) and Jodhpura (*IAR* 1972-73 : 29-30), in Rajasthan confirmed the independent status of the BRW with a stratigraphic sequence similar to that of Atranjikhera. The reason for the thin deposit at Atranjikhera is attributed to flood activity (Gaur 1967 : 4). The thickness of deposits at Noh and Jodhpura are not mentioned in brief reports published in *Indian Archaeology —A Review*.

Pottery

The characteristic feature of this pottery is that it is black inside and near the rim on the outside, and rest of the body, red. It is of fine clay and mostly made on a wheel. The fabric is generally fine with thin walls and firing is generally perfect. Some of the types, specially dishes, are ill-fired and have a gritty core. Some pots are also made by hand. Unlike in the case of BRW from Rajasthan, Madhya Pradesh, Bihar and West Bengal, the pottery is devoid of painting.

It is believed that this pottery was produced by inverted firing (Lal 1954-55; Sankalia 1968, 1974). No scientific test has, however, been carried out to test this long-held hypothesis. In Egypt, where this type of pottery is also found, the same theory was accepted, until Lukas (1962 : 380) on the basis of his experiments pointed out that the technique was much more complex. He expressed the probability of double firing and the application of carbon on the surface to turn the red colour, produced in the first firing, into black.

Following are the shapes in the BRW (Fig. 11) :

(1) Bowl with a vertically sharpened rim. (No. 1).
(2) Bowl with a featureless rim. (Nos. 2-3).
(3) Bowl with slightly everted rim. (Nos. 4-5).
(4) Dish with featureless rim and convex sides forming a sagger base. (No. 6).
(5) Jar with slightly out-turned rim. (No. 7).

Material Culture

At Atranjikhera no definite tool either in metal or in stone was found. Only fragments of stones, waste flakes, chips, and cores of quartz, chalcedony, agate and carnelian were found. Ornaments are represented by one bead each of

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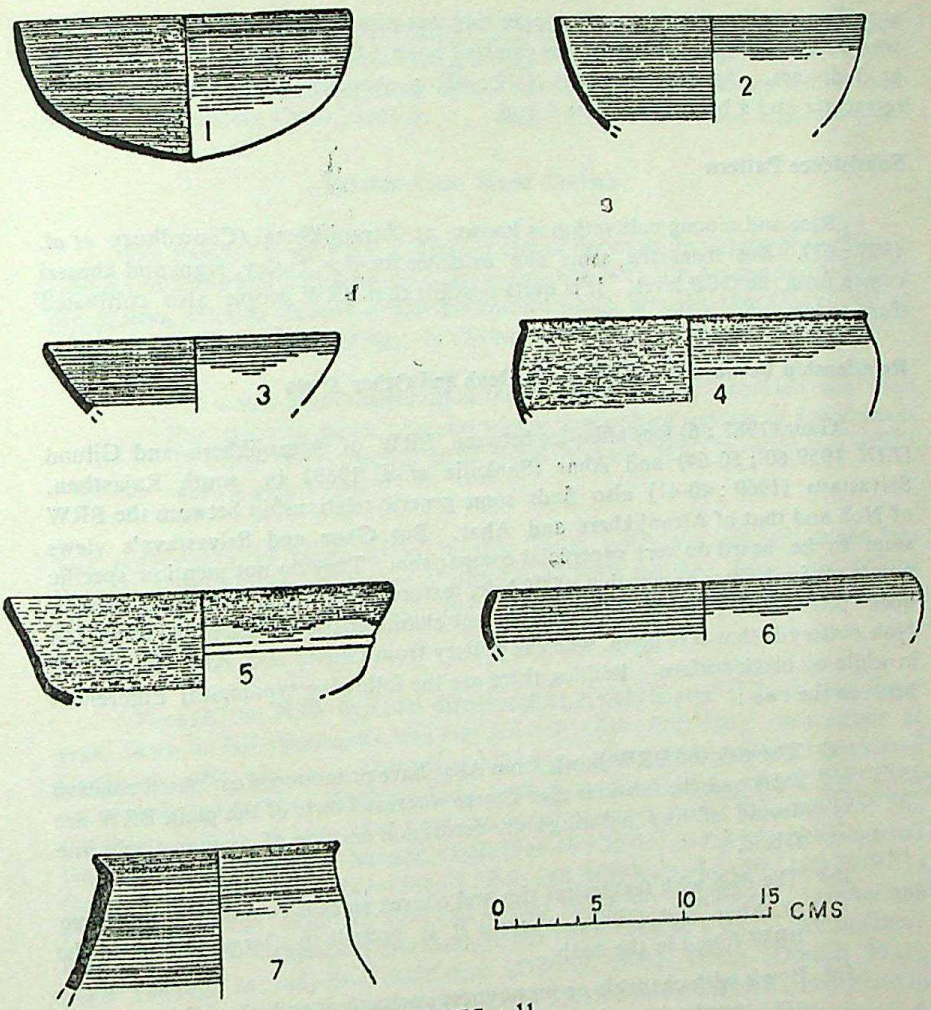

FIG. : 11.

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carnelian, shell and copper. A copper ring was also found. The only other object worth mentioning is a fragmentary comb of bone. Only a bone spike was found at Jodhpura. At Noh (*IAR* 1971-72 : 42) a shapeless piece of iron, a bead of terracotta and a bone spike were found.

Subsistence Pattern

Rice and moong cultivation is known at Atranjikhera (Chowdhury *et al.* 1977 : 63). But from the same site evidence for rice, barley, gram and khaseri comes from the OCP level. It is quite possible that BRW people also cultivated these crops.

Relationship Between the BRW of the Doab and Other Areas

Gaur (1967 : 6) sees affinities between BRW of Atranjikhera and Gilund (*IAR* 1959-60 : 60-64) and Ahar (Sankalia *et al.* 1969) in south Rajasthan. Srivastava (1969 : 40-41) also finds some generic relationship between the BRW of Noh and that of Atranjikhera and Ahar. But Gaur and Srivastava's views seem to be based on very superficial comparison. They do not mention specific points of similarities except that of "fabric, texture, burnishing and other techniques" (Gaur 1967 : 6). The most important characteristic feature of the doab and Noh pottery is that it is plain, whereas pottery from Gilund and Ahar is painted in white on black surface. Besides, there are the following typological differences between the two :

(a) The painted BRW bowls from Ahar have pronounced carinated concave sides and the fabric is also coarse whereas bowls of the plain BRW are devoid of any paintings or carination and are of comparatively fine fabric.

(b) The dish with featureless rim and convex sides is completely unknown at Ahar and Gilund whereas it is present in a large number in the BRW found in the doab.

(c) Bowls with channels or pronounced carination and the dish-on-stand are completely unknown in the BRW of the doab whereas they are present at Ahar and Gilund.

Spread of BRW

The process and routes of diffusion of BRW are debatable. Gupta (1969 : 111) suggested that there were two probable routes of movement of the BRW people from Rajasthan : (a) through Chambal and Yamuna the ware reached Kausambi and Prahladpur etc. and then took a backward turn towards the Central and Upper doab and (b) from Ahar to Eran, and then along the Vindhyan hills the BRW people entered the eastern part of the country. Agrawal (1971 : 106-7)

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on the basis of C-14 dates suggests that BRW spread in two waves from Rajasthan : One going northwards, which deflects from the western doab to spread into eastern Panjab, and the second goes to west Bengal via central India and then recoils back to Bihar and eastern Uttar Pradesh.

Painted Grey Ware Culture

The Painted Grey Ware Culture is one of the most important protohistoric cultures of India not only because of its association with the Aryans and the early use of iron, but also because it was this culture which brought the Ganga valley to the threshold of urbanisation. In the words of Romila Thapar (1978 : 91) :

> "It would seem feasible that this material culture provided the base for the emergence of states with a monarchical system of government in which the control of agricultural land and rights to succession would play a major role."

The potentiality of urbanisation in the Ganga valley was realized for the first time primarily because of the use of iron by the PGW people. Iron tools helped PGW people to clear and settle in the then dense monsoonal forests of the upper Ganga Plains.

Though, the PGW was first discovered at Ahichchhatra (Ghosh and Panigrahi 1946) its full significance was realized only after B.B. Lal's excavations at Hastinapura in the early fifties (Lal 1954-55). Since then, explorations carried out in different parts of Northern India have brought to light about 650 sites. Of these, nearly 30 sites have been excavated of which Rupar (Sharma 1955-56), Dadheri (Joshi 1978) and Sanghol (*IAR* 1968-69 : 25-26) in Panjab; Bhagwanpura (Joshi 1978), Daulatpur (*IAR* 1968-69 : 8-9) and Raja-karna-ka-qila (*IAR* 1970-71 : 15-16) in Haryana; Noh (Agrawal and Kumar 1976) and Jodhpura (Agrawal and Kumar 1976) in Rajasthan and Alamgirpur (*IAR* 1958-59 : 50-55), Atranjikhera (*IAR* 1962-63 to 1967-68), Allahpura (Dikshit 1973), Hulas (Dikshit 1981), Jakhera (Sahi 1978), Mathura (*IAR* 1975-76 : 53-55) and Sonkh (Haertal 1976) in Uttar Pradesh are the most noteworthy ones. The lack of horizontal excavation and publication of full reports of whatever excavations have been done precludes a detailed picture of the PGW culture.

Extent and Distribution Pattern of PGW Sites

The main concentration of the PGW is in the Indo-Gangetic divide, the Sutlej basin and the upper Ganga plains. Sporadic sherds have, however, been found as far as Vaisali (Bihar) in the east, Lakhiyopir (Sind, Pakistan) in the west, Thapli (Tehri District, Uttar Pradesh) in the north and Ujjain (Madhya Pradesh) in the south (Fig. 12).

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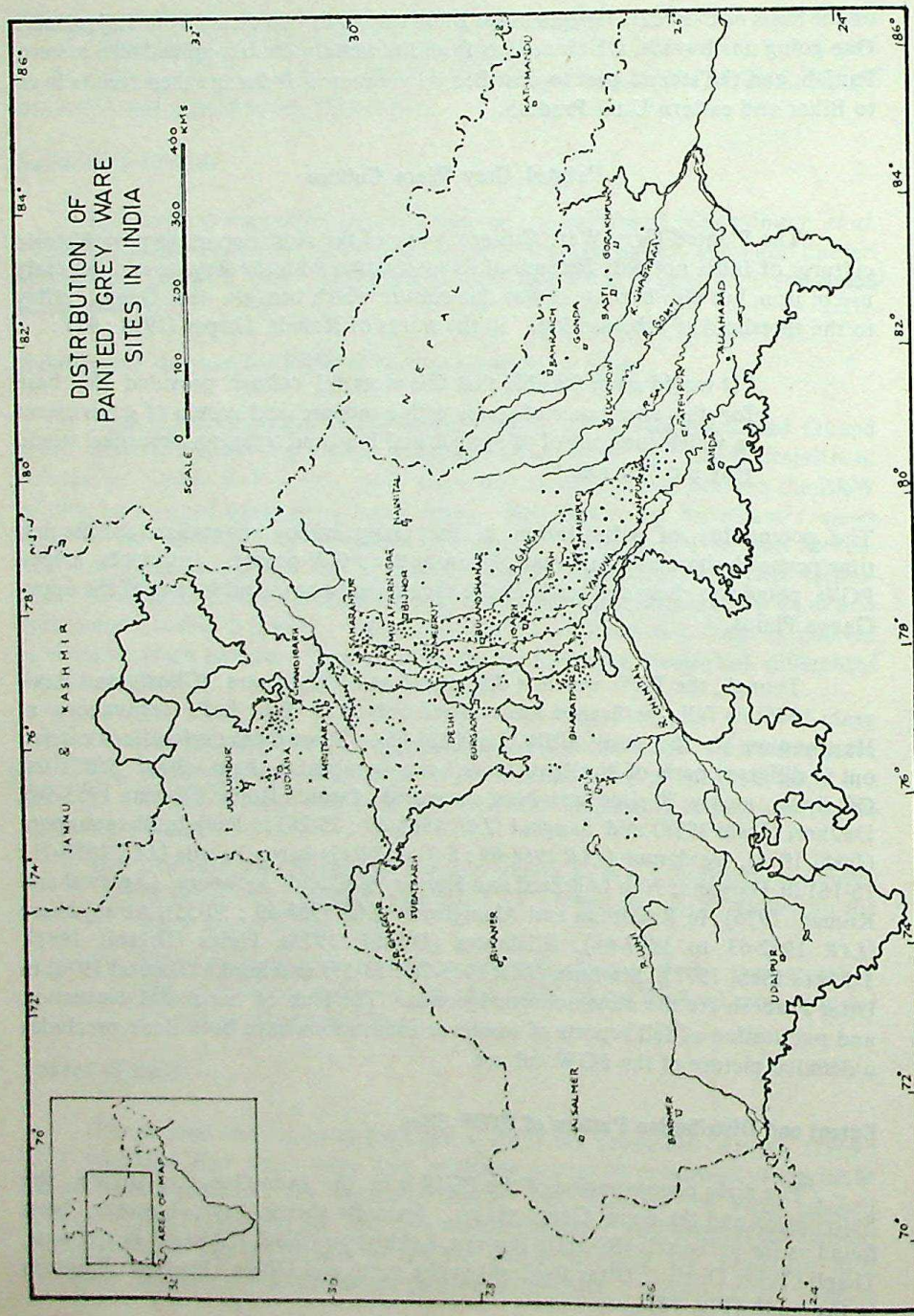

FIG. 12.

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Painted Grey Ware sites are located along river banks. The average distance from one site to another is about 10-12 km and in favourable ecological zones it is even 5 km. (Agrawal and Kumar 1976, Lal 1978). The settlements are mostly small villages of 1 to 4 hectare of habitation area. In Haryana one settlement was found to be of 9 hect. (Suraj Bhan and Shaffer 1978). Mughal (1978, 1979) reports one settlement of 13 hect. on the Hakra in Bahawalpur region of Pakistan.

Stratigraphy

Stratigraphically PGW is found in four contexts. At the sites of Rupar and Sanghol in Panjab, Daulatpur in Haryana, Alamgirpur and Hulas in western Uttar Pradesh it is preceded by the late Harappan culture but with a gap between the two cultures. At Dadheri, Kathpalon and Nagar in Panjab and Bhagwanpura in Haryana the PGW has an interlocking phase with the Late Harappan culture. At Hastinapura and Ahichchhatra in Uttar Pradesh it is preceded by the OCP culture with a break, whereas at Atranjikhera in Uttar Pradesh and Noh and Jodhpura in Rajasthan the PGW is preceded by the BRW culture with a break in-between the two cultures. On the upper side, everywhere it overlaps with the NBPW culture.

Pottery

PGW constitutes 3-10% of the total pottery assemblage at sites of this culture. The pottery is wheel-thrown and made of well-levigated clay. Its surface is smooth and grey to ashy-grey in colour. It has a fine-grained uniformally thin core. Sometimes, a small number of heavier particles of feldspar, quartz or limestone are found in the core. Hegde (1975 : 188) who produced this ware in the laboratory says that it was fired in reducing conditions at a temperature of about 800°C and by retaining the kiln at that temperature for at least about 12 hours.

In the PGW mainly bowls and dishes of various shapes and sizes are found. Following are the main types (Fig. 13) :

(1) Bowl with straight sides (Nos. 1-3, 5).
(2) Bowl with tapering sides (Nos. 4, 21).
(3) Bowl with convex sides (Nos. 10-11).
(4) Bowl with hemispherical sides (No. 8).
(5) Bowl with incurved sides (Nos. 9, 13).
(6) Bowl with concave sides (No. 7).
(7) Bowl with corrugated sides (No. 19).
(8) Legged bowl (No. 16).

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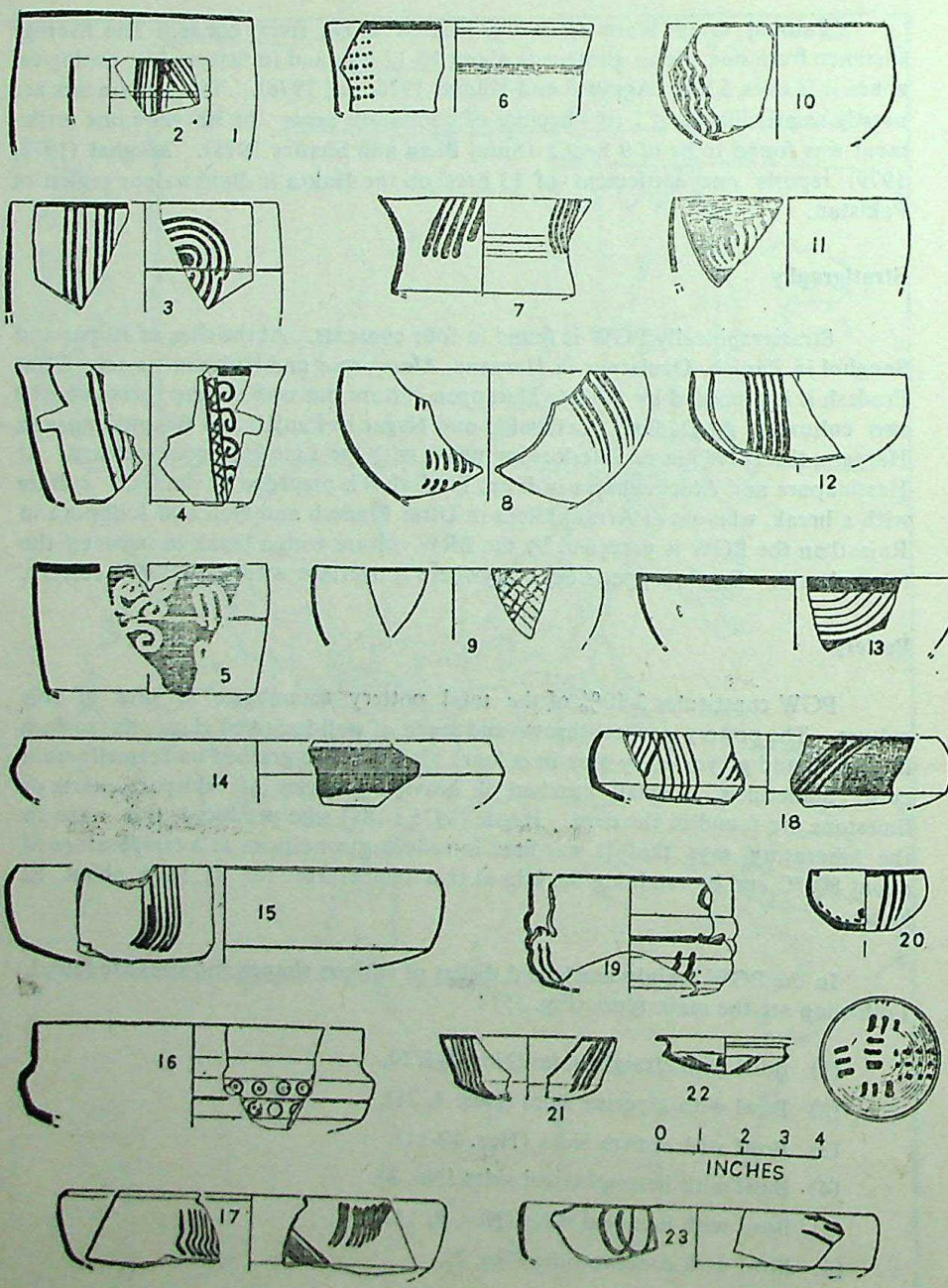

FIG. : 13.

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(9) Miniature bowl (Nos. 20, 22).

(10) Dish with featureless rim and rounded sides (No. 14).

(11) Dish with featureless rim and straight sides (No. 23).

(12) Dish with featureless rim and tapering sides (No. 17).

(13) Dish with convex sides and carination at the base (No. 15).

Other less common types in this ware are water vessel (*lota*) (from Rupar), spouted vessel (from Sardargarh) and ring vase (from Allahpura). A big water jar has been found at Sonkh (Haertel 1976 : Fig. 21).

Pots were decorated by paintings in black and sometimes in a deep chocolate colour on the outer as well as inner surfaces. Hegde (1975 : 188) has reached the conclusion that the paintings were made on sun-dried pots before firing.

Tripathi (1976 : 132) has listed 42 designs on the PGW. Following are the main types :

(1) Simple horizontal band.

(2) A group of vertical, oblique and criss-cross lines.

(3) Rows of dots and dashes.

(4) Dots alternating with simple lines.

(5) Chains of small spirals.

(6) Concentric circles and semi-circles.

(7) Sigmas and swastikas.

(8) Rows of a scalloped pattern.

(9) Simple and intersecting loops.

Of these, 9 designs 1, 2, 4, 6 and 9 are usually found on both inside as well as outside surfaces whereas 3, 5, 7 and 8 are generally restricted to the outer surface only.

Architecture

At Ahichchhatra, Hastinapura, and Atranjikhera only patches of burnt earth, mud bricks, burnt bricks, mud platforms, and mud plaster pieces with reed and bamboo impressions have been found. Bhagwanpura, however, has given some substantial evidence for structural activity (Joshi 1978). Here Joshi has identified three structural phases. In the first phase, architectural features consist only of post holes which suggest circular and rectangular huts. In the second structural phase, houses were planned. One house has 13 rooms with a corridor

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in between the two sets of rooms and a courtyard on the eastern side of the complex. The size of rooms varies from 1.6 m.×1.6 m. to 3.55 m.×4.2 m. and the walls are made of mud. During this phase houses had thatched roofs.

In the third phase houses were built of burnt bricks. Due to the present day cultivation on the mound the exposed structures were badly damaged. Thus, the plan of structures could not be known. The sizes of burnt bricks were 20 cm.×20 cm.×8 cm., 12 cm.×12 cm.×8 cm., 30 cm.×20 cm.×8 cm., 16 cm.×12 cm.×4 cm. and 29 cm.×22—12.5 cm.×7 cm. The first two sizes are square, the second two are rectangular, whereas the last one is wedge shaped. Since bricks used for walls are generally rectangular and not square, the latter were probably used for the construction of ritualistic altars or some similar structures. The wedge-shaped bricks were probably used for the construction of wells or other circular structures.

The occurrence of mud-plaster bearing impressions of reeds and bamboos from Atranjikhera (Gaur 1967 : 11) and Hastinapura suggest that the walls were made of bamboo and reed screen on which mud plaster was applied from the outside as well as inside. To strengthen the plaster, rice husk was mixed with mud. At Atranjikhera wood posts of Chir (*Pinus roxbureghii*), Sisso (*Dalbergia sissoo*), Sal (*Sheorea robusta*) and Teak (*Tectona grandis*) have been found (Chowdhury *et al.* 1977 : 66). Even today these are considered to be the best woods for house construction. At Atranjikhera sand found in some post holes was put probably to protect the posts from white ants (Lal n.d. : 10).

From Atranjikhera (Lal n.d. : 12) and Jakhera (Sahi 1978 : 102) there is evidence for the construction of a mud bund. At Atranjikhera an embankment of 35 m. in length and 1.4 m. in height was exposed. At Jakhera an embankment with a basal breadth of 4.8 m. and a height 1.2 m. was excavated. Sahi (1978 : 102) feels that the embankment ran all around the settlement.

Technology

The material culture of the PGW period reveals a variety of objects made out of copper, iron, glass and bone. Axes, chisels, borers, nails, pins, clamps, fish hooks and arrowheads are found both in iron and copper. Spearheads have been found only in iron. Agricultural implements that have come to light are only a sickle and a hoe from Jakhera (Sahi 1978 : 103). In bone only points and arrowheads have been found.

Tools like axes must have been used in cutting wood and clearing forests. Chisels, borers, nails and hooks may have been used in carpentry. Arrowheads mounted on caneshafts and projected from wooden bows could have been used in warfare as well as in hunting.

In the succeeding pages we shall deal with the technology of copper, iron, glass and bone separately.

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Copper

All the copper objects found in the PGW culture are made of pieces cut from a sheet and then forged. None were made in moulds. In the absence of a metallurgical analysis of any object it is not possible to say anything about the forging process. However, the result of a chemical analysis of five objects are available. Of these, two came from Hastinapura and three from Atranjikhera. Hastinapura objects do not show any alloying (Lal 1954 : 55 : 13). Of the Atranjikhera specimens (Lal n.d. : 24) one is of pure copper and two are alloyed. One specimen shows 11.68% tin, 9.0% lead and 6.28% zinc and the other shows 20.72% tin and 16.2% zinc. Iron was present in all the three objects from 1.23% to 9.7%. The presence of iron indicates that the metal was extracted from iron-chicopyrite ore and the iron was infact probably due to inadequate smelting.

Iron

The Painted Grey Ware people were the first in the Ganga-Yamuna doab to use iron. The metal has been found at all the sites except Hastinapura. At Atranjikhera as many as 135 objects were found in a small dig. Because complete excavation reports are not available, except for Hastinapura, it is not possible to know the relative proportion of iron and copper objects.

At Atranjikhera a furnace was also found (Gaur 1967 : 11-12). Close to the furnace were found iron slag, broken pots used for quenching and a pair of tongs to turn over the objects. Evidence for two furnaces comes from Jodhpura (Agrawal and Kumar 1976 : 243). These are of an open type and are provided with bellows. One of these was used to extract the bloom and other for heating during forging. The metal was first extracted by a direct reduction of ore (without any flux) and then the small bloom that separated out was taken out of the furnace, heated to redness in an open hearth and then forged on a platform in front of the hearth (Agrawal and Kumar 1976 : 243).

O.P. Agrawal (Lal n. d. : 22) who examined four specimens from Atranjikhera opines that these objects were first made of wrought iron and then were carburised by some technique whereby the surface turned into carbide.

No work has been done to identify the source from which PGW people got the iron ore. The source, however, exists in the neighbouring Himalayan region of Kangra, Mandi, Almora and Garhwal; in the Aravalli terrain of Alwar, Jaipur and Bharatpur in Rajasthan and in the Gwalior region, immediately south of the Chambal.

Glass

A remarkable contribution of the Painted Grey Ware people is glass technology. At present the evidence counts of only two glass bangles from Hastinapura.

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One of these is brown and other is black in colour. The colour in both cases is due to the presence of iron (Lal 1954-55 : 13). The hardness of the former specimen lies between 5 and 6 and the specific gravity is 2.55. In the latter case, the hardness is about 6 and the specific gravity 2.56. The specimens may be described as of "soft glass of the soda-lime type". Both are free from weathering and decomposition and "therefore, it seems probable that after fabrication, the bangles were subjected to annealing" (Lal 1954-55 : 13).

Bone

A majority of the bone objects found in the PGW levels are made out of antlers. Dikshit (1970) examined the specimens from Allahpura. The microscopic studies of these objects revealed some important clues regarding the mode of fabrication of bone tools. The bone-antlers were softened by immersion in hot water for sometime. In some cases coconut oil was used as a softener. In the case of a few objects antler pieces were first burnt as is evident from the carbonization of the outer surface, then they were dipped in a suitable softening medium and finally cut to the desired shape by the use of a fixed crude lathe which could have been made of iron. On one of the objects there are regular concentric lines over the whole body. They appear to have been made by some sharp crude type of lathe and as the pattern is more or less regular it appears that the bone object was revolving on a definite axle.

After fabrication, the tools seem to have been polished with the help of a smooth stone and finally rubbed with soft skin. Another way was to use wax or oil (Lal n.d. : 26).

Material Culture

Excavations at various sites have brought to light a variety of cultural material which can be grouped under the following headings :

Ornaments

The most common object for ornaments are beads. They are found in terracotta, agate, jasper, carnelian, chalcedony, lapis lazuli, glass and bone. Of lapis lazuli only one bead has been found from Sardargarh (Tripathi 1976 : 94). Bangles have been found mainly in terracotta. Only two broken pieces of glass bangles have been found at Hastinapura (Lal 1954-55 : 90-91), Rings and bangles of copper have also been found but in a limited number. The only example of a pendant comes from Hastinapura (Lal 1954-55 : 89) and it is of terracotta.

Kitchen and Other Household Objects

Pestles and querns of stone are the most commonly-found kitchen tools. A

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pair of tongs have been found at Atranjikhera (Lal n.d. : 22). The other household objects, made of iron as well as copper are nails, pins, needles, knives, tooth-picks and hooks. Among pots and pans so far only one dish of copper with a diameter of 17 cm. has been found at Atranjikhera (Lal n.d. : 25). A fragmentary comb of bone has also been found at Atranjikhera (Gaur 1967: 15).

Terracotta Figurines

Excavations at Jakhera brought to light three terracotta human figurines two males and one female. These are made of well levigated clay. All of them have incised decoration over the body and a blackish-grey colour. Three animal figurines have been reported from Hastinapura (Lal 1954-55 : 86). One has been identified as a bull, the second is a "crudely modelled figurine, perhaps a bull" and the third is said to be "probably a horse".

From Ahichchhatra (IAR 1963-64 : 43-44), also, animal figurines have been reported but particular animals have not been mentioned.

Miscellaneous Objects

Miscellaneous objects include several types of terracotta discs, balls, potter's stamps, gamesmen, and circular discs made of broken pottery. Several indeterminate objects have been found in terracotta, bone, shell and horn.

Subsistence Pattern

Evidence for subsistence comes from two sites—Hastinapura and Atranjikhera. At Hastinapura (Lal 1954-55 : 123) only rice (*Oryza sativa*) was found. At Atranjikhera rice (*Oryza sative*), wheat (*Triticum compactum*) and barley (*Hardeum vulgare*) were found (Chowdhury *et al.* 1977 : 63).

The PGW people cultivated rice, wheat, barley, peas and some other legume. The most important cereal that was added to the diet during the PGW period was wheat—it has not been found in any of the earlier cultures in the doab. However, it is important to note that at Atranjikhera, quantitatively, rice exceeded wheat and barley. Thus, it seems that rice dominated the staple diet of the PGW people. While rice may have been boiled and eaten, wheat and barley were ground with mortar and pestle. From the ground flour one may imagine *chapatis* (bread) were prepared on a 'U' shaped *chulha* (hearth) as is done even today. Milk and its preparations viz. curd, *ghee*, cheese, buttermilk etc. were also part of the diet. Likewise fowl, river turtle and bivalve were also consumed. Bones of horse, bull, pig, goat and deer have been found at Hastinapura, Allahpura and Atranjikhera. The occurrence of fish-hooks from several sites suggests that fishing was a part of the food economy.

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Trade

There is some evidence of trade in the PGW period. There are no copper or iron ores in the doab. The ore deposits in the Kumaon hills were the nearest source for the PGW people. It is difficult to say whether this source of ores was exploited during the PGW period but the recent discovery of a PGW site at Thapli (Nautiyal 1981) in Tehri district, U.P. is important. There may be more PGW sites in that area and their existence could be due to the need of exploiting the ores. The ores, as well as finished goods, may have been traded with the people in the plains. The population pressure on the land in the plains could not have been sufficient to force people to migrate into the hilly country. Settlements may spring up in wastelands where rare and valuable minerals are found (Trigger 1978: 180). In ancient times, copper smelters were built at Aqaba on the shores of Red Sea, a region rich in copper but lacking in agricultural potential.

Other objects that give some idea of trade are the beads of semi-precious stones like agate, jasper, carnelian, chalcedony and lapis lazuli. None of these stones is found in the doab. Agate and chalcedony are found in Rudak (Kashmir), Rajpipla, Ahmedabad and Morvi (Gujarat), Jabalpur (Madhya Pradesh), Rajmahal (Bihar), and in the beds of the Krishna, Bhima and Narmada. Jasper is found in Bellary (Karnataka) and lapis lazuli in Badakshn (Afghanistan), and Tibet (Coggin-Brown and Dey 1955). The only way to explain the occurrence of these beads is trade, either of finished beads or of raw material.

Transport and Travel

We are on very uncertain ground so far as transport is concerned. The horse has been mentioned in the *Rigveda* and other Vedic literature, and its bones have been found in excavations of PGW sites. Whether some kind of cart (like the present day bullock cart), or chariot, was used is uncertain. We do not come across any toy carts or model chariots in excavations, though references to their use have frequently been made in contemporary literature. Boats may have been used by the PGW people as the PGW sites are largely on river banks. As forests covered most of the uninhabited land, the passage through jungles infested with wild animals and possibly inhabited by hostile aborigines must have been hazardous. Under such conditions transport and travel on water must have been the safest.

Origin and Spread of PGW

Lal (1954-55: 32-33) drew attention of the occurrence of pottery resembling PGW from Tsani, Tsangali and Zerila in Thessali; Shah Tepe and Seistan in Iran and Shahi Thump in Baluchistan dating to second millennium B.C. and expressed the possibility that the PGW originated in the west and was introduced in India from that area.

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Misra (1970) suggested the origin of PGW from BRW on following grounds :

(1) Nearly 50% of the PGW shapes occur in BRW.

(2) PGW has not been found far beyond the western boundary of India.

(3) The concentration of sites suggests the epicentre of the culture to be Panjab, Haryana and western Uttar Pradesh.

(4) Mere occurrence of grey ware outside India, does not necessarily imply a relationship with PGW.

(5) In Asia Minor, the Hittites and the Mittani are supposed to have been Aryans and several sites there have yielded relics of these people. But none of them has yielded PGW.

Misra's observations about common shapes in BRW and PGW and the absence of PGW outside India are sound. Though 14 sites of PGW have been found on river Hakra in Bahawalpur (Pakistan), they are near the India-Pakistan border. They can be considered a continuation of the sites on the Ghaggar river in Rajasthan. But other points do not stand on critical assessment of the evidence. In the epicentre area of PGW we find that there are only three sites—Atranjikhera in U.P. and Noh and Jodhpura in Rajasthan—where BRW precedes PGW. All these three sites are located on the outskirts of the epicentre. In U.P. at all the sites, except Atranjikhera, PGW is preceded either by Late Harappan or OCP with a break. In the region of Haryana and Panjab PGW is preceded by Late Harappan with a break, except at Bhagwanpura and Dadheri, Kathpalon and Nagar. At all these sites the PGW has an interlocking phase with the Late Harappan. At Manda, in Jammu, also, PGW has an interlocking phase with the Late Harappan.

If we consider the origin of PGW from BRW we have to prove that (1) the sites in Haryana, Panjab and Jammu are younger than the sites in Uttar Pradesh and Rajasthan, and (2) there was an experimental stage of PGW in western Uttar Pradesh and northern Rajasthan. The evidence available does not fulfil any of these conditions; rather it goes against. The stratigraphic evidence shows that in Haryana, Panjab and Jammu PGW is older than the PGW in western Uttar Pradesh and northern Rajasthan. Also, we do not find any experimental stage of PGW, not only in the western Uttar Pradesh and northern Rajasthan, but in the entire PGW distribution area.

Since Lal gave his theory of the foreign origin of PGW, a flood of new evidence has come to light. In the 1960s and early 1970s archaeological work was carried out in Swat valley (Pakistan). This area is geographically located on the land routes linking India and Central Asia. In Swat valley at a number of sites, graveyards have been discovered and, in a few examples, there are habitation sites also (Dani 1967, 1971; Stacul 1967, 1970). The main excavated sites are

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Timargarha (Dani 1967) and Ghaligai (Stacul 1967). At these sites, grey ware and iron appear for the first time between 1300-1200 B.C.

Pirak Damb, a site on the Kachhi Plains in Baluchistan has yielded important evidence in this respect. Of the 11 occupational levels, level 6 yielded grey ware and black pottery along with iron objects. This level can be dated to about 1100 B.C. on the basis of calibrated radiocarbon dates for levels 4 and 5 (Jarrige and Enault 1973 : 170-71).

On the basis of the occurrence of grey ware, and iron at Ghaligai, Timargarha and Pirak. PGW in India, and movement pattern of Aryans, Dani (1967, 1971, 1978), Stacul (1969, 1970), and Jarrige and Enault (1973) emphasize the links between the grey ware of Swat valley and PGW of India. Dani (1967 : 51) writes "It may not be improper to seek the origin of the PGW to the development of the grey ware of the Gandhara Grave culture in the as yet unexplored intervening plains between the Indus and Beas."

Thapar (1970 : 161) is of the opinion, "The PGW of the Ganga-Yamuna Doab seems to belong to the grey ware complex which had suddenly intruded upon the ceramic traditions of northern Iran towards the end of third millennium B.C. At the same time it may be admitted that besides similarity in the tradition of firing and kiln there is little to compare in the forms, fabric and decoration of the PGW with those of the Iranian ware. The latter complex probably sent out feelers for the east by a route that is yet imperfectly understood."

Thapar (1970 : 161) further emphasized, "The link of grey ware complex, howsoever tenuous, is reinforced *a fortiori* by (a) the evidence about the use of horse in association with grey ware in northern Iran (Shah Tepe II and III) Swat Valley and the Gandhara region of Pakistan (Gandhara Grave culture) and Upper India (PGW late levels), and (b) the association of predominantly mediterranean type of people with this grey ware, at least in northern Iran and Swat valley."

The absence of a common pottery tradition has been explained by Ghosh (1968). He suggested that the migrating folk adopted the local traditions in the absence of their own pottery tradition which was also difficult to pursue in the wake of constant migrations.

In the light of this discussion it may be concluded that Misra's points 4 and 5 do not stand and the origin of PGW lies in the west.

Northern Black Polished Ware Culture

The Northern Black Polished Ware (NBPW) culture in the Ganga valley is distinguished by the extensive use of iron, introduction of coinage, a well stratified and economically strong society, expansion of Buddhism and assimilation of a

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number of smaller states into one of the biggest empires of the ancient world. The period of this culture coincides with the urbanisation of the Ganga plains.

The NBPW, the 'terra sigillata' of India was first discovered at Taxila in 1913 (Marshall 1951). Only 21 sherds were found and due to their black shining surface Marshall took them as "Greek Black Ware". In the early 1930s and 1940s NBPW was found mainly in the Ganga plains. But, since then, it has been found over a much wider area. The pottery occurs as far as Taxila, Charsada and Udgram (Pakistan) in the northwest, Tilaurakot (Nepal Tarai) in the north, Prabhas Pattan (Gujarat) in the west, Tamluk (W. Bengal) in the east and Amaravati in the south. Though NBPW is distributed over a very large area, the main concentration of its sites is in Panjab, Haryana, northern Rajasthan, Uttar Pradesh, Bihar and West Bengal. So far, nearly 1,500 sites of NBPW are known. The main excavated sites are Rupar (Sharma 1955-56) in Panjab, Raja-Karna-ka-Qila (*IAR* 1974-75 : 16) and Daulatpur (*IAR* 1972-73 : 12-13) in Haryana, Bairat (Sahni 1937), Noh (*IAR* 1971-72 : 42) and Jodhpura (*IAR* 1972-73 : 29-30) northern Rajasthan, Ahichchhatra (Ghosh and Panigrahi 1946), Hastinapur (Lal 1954-55), Atranjikhera (Gaur 1967), Kausambi (Sharma 1960, 1969), and Sravasti (Sinha 1967), in Uttar Pradesh and Kumrahar (Altekar and Misra 1959), Vaisali (Deva and Misra 1950, Sinha and Roy 1969), Pataliputra (Sinha and Narain 1970) and Sonepur (Sinha and Varma 1977) in Bihar.

Stratigraphy

In Panjab, Haryana, northern Rajasthan and western Uttar Pradesh, NBPW is preceded by PGW with an overlap phase between the two cultures at sites of Rupar in Panjab; Raja-Karna-ka-Qila in Haryana; Noh and Jodhpura in Rajasthan and Ahichchhatra, Atranjikhera in Uttar Pradesh. In eastern Uttar Pradesh at the site of Prahladpur, in Bihar at Kumrahar, Vaisali and a number of other sites, NBPW is preceded by BRW. In all the areas mentioned above NBPW is succeeded by Red Slipped Ware.

Phases in NBPW Period

On the basis of pottery frequency and associated antiquities, Sinha (1969) divided NBPW period into two phases :

Phase I

This phase is known as the pre-defence phase also. During this phase NBPW occurs in good number. Sherds of BRW and PGW are also found, though in a restricted number. Punch-marked coins and burnt brick structures are absent. This phase is represented by Atranjikhera V, Sravasti I and Prahladpur I.

Phase II

This phase is characterised by the absence of BRW and PGW and a greater

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use of coarse grey ware. The NBPW occurs less and is generally thicker in fabric. Punch-marked coins and burnt-brick structures make their appearances. This phase is represented by Hastinapura III, Atranjikhera V B, Sravasti II and Prahladpur I C.

At Sringaverapura Lal and Dikshit (1980) have divided NBPW period into three phases. Phase A is characterised by the occurrence of NBPW in greater quantity along with Black Slipped Ware (BSW) and PGW. In phase B, BSW and PGW are absent but in the NBPW fabric, miniature bowls and *handis* make their appearance. Phase C is characterised by the poor quality of NBPW and preponderance of coarse grey ware, and the appearance of burnt-brick structures.

Pottery

The pottery is made of well-levigated clay on a fast wheel. The thickness of the ware is generally uniform and sometimes as thin as 1.5 mm. The core is grey and free from any impurity. The pottery is well fired. Besides black, NBPW is found in golden, silver white, pinkish, steel blue, blue, chocolate and brown colours. The rivetted pots have been found at Rupar, Bairat, Sonepur, and Kumrahar. This suggests that pottery was a highly valued commodity.

Typologically NBPW can be classified into the following categories (Figs. 14, 15) :

(1) Bowl with straight sides (Nos. 1, 2, 4).
(2) Bowl with convex sides (Nos. 3, 5, 6).
(3) Bowl with tapering sides (Nos. 7-10).
(4) Bowl with corrugated sides (Nos. 11-13).
(5) Bowl with flange on the shoulder (Nos. 14-16).
(6) Dish with incurved rim and convex sides (Nos. 18-19).
(7) Dish with featureless rim and straight sides (Nos. 20-22).
(8) Dish with closing featureless rim (No. 23).
(9) Lid with flat terminal and knob (Nos. 24-25).
(10) Handi with sharp carination (Nos. 26-29).
(11) Miniature vase (Nos. 30-31).

The glossy surface of the NBPW is generally unpainted but painted sherds are not altogether lacking. Painting is done in yellow and light vermillion colours. Painted designs are : simple bands, wavy lines, dots, concentric and intersecting circles, semi-circles, arches, and loops.

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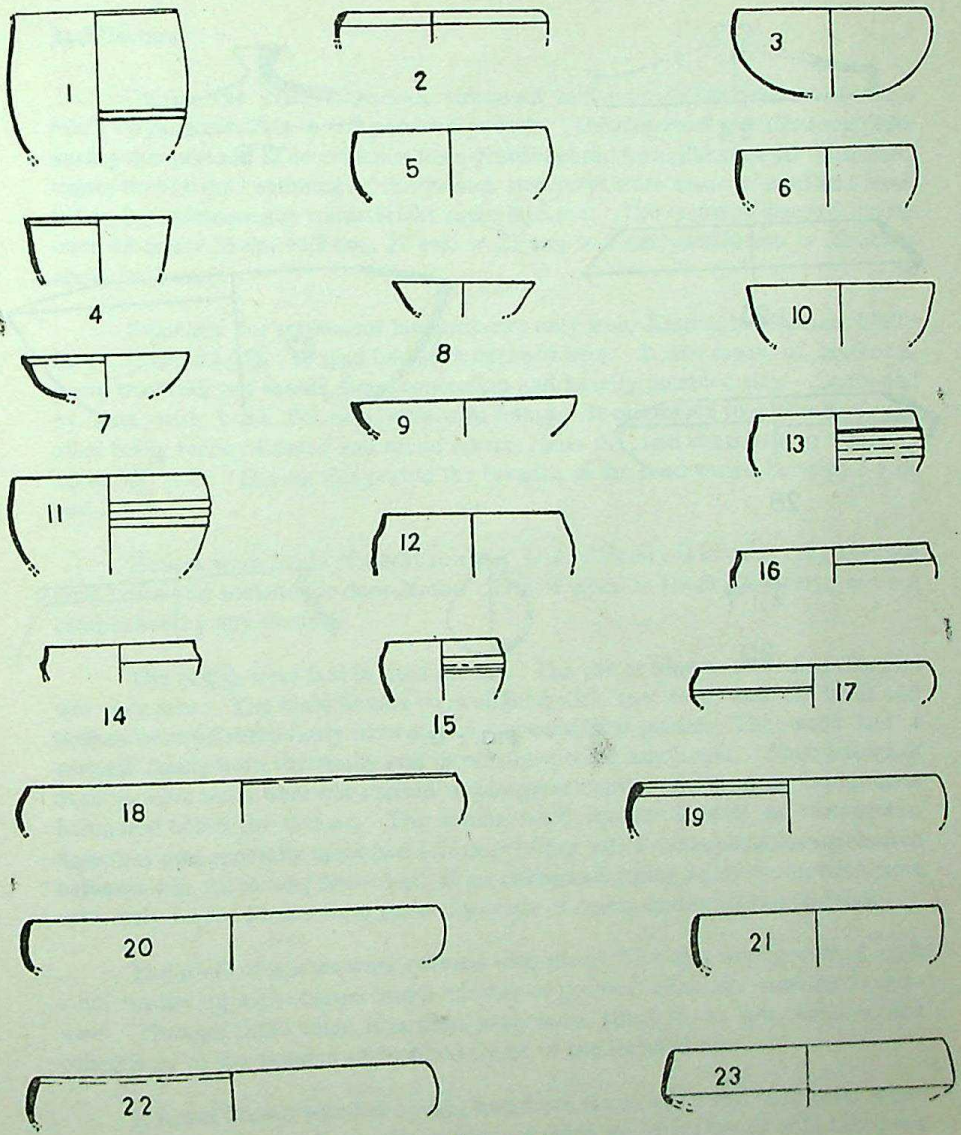

FIG. : 14.

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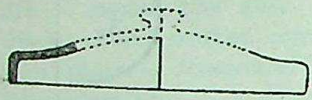
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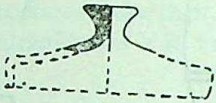
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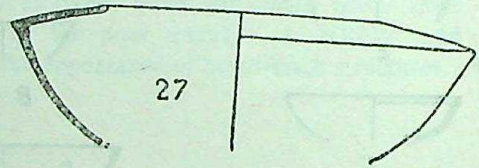
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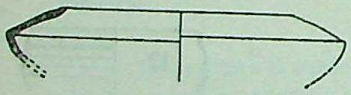
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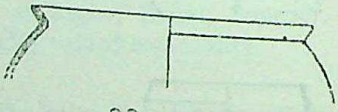
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FIG. : 15.

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Architecture

During the NBPW period, structural activities in the doab started on a much larger scale than in the previous periods. Development of cities took place during this period. The evidence from Hastinapura, Atranjikhera and Kausambi shows that at the beginning of this period, structures were made of mud and mud-bricks but subsequently burnt-bricks came into use. The common sizes of bricks were 43 cm. × 25 cm. × 7 cm., 27 cm. × 22 cm. × 7 cm. and 30 cm. × 22 cm.—15cm. × 7 cm.

Evidence for settlement layout comes only from Kausambi (Sharma 1960 : 26-44, 1969 : 24-35). A road has been exposed here. It was made of brickbats, gritty material, pot sherds, lime, concretion and heavily pounded clay. Lanes and by-lanes with brick flooring were also found. It originated in c. 600 B. C. and after being reconsolidated and relaid several times the road continued to function up to 300 A.D. During this period the breadth of the road varied between 5.5 m. and 2.5 m.

Houses were made of burnt bricks. Use of timber is known only through post-holes and sockets for door-jambs. Use of wood in roofing is likely, but not established by any remains.

The bricks were laid in mud mortar. The use of lime as a binding material was very rare. The main houses were aligned with the road and the lanes and houses were oriented fairly correctly with the cardinal points. The walls had a vertical facing both externally and internally without any batter. Foundations of even massive walls were not carried to any great depth, only three or four courses being laid below the surface. The rooms were square as well as rectangular. Square rooms generally measured 1.75 m. × 1.75 m. while rectangular ones measured between 4 m. × 2 m. and 5m. × 2 m. Brick columns forming an open varandah were extremely rare. Floors were generally made of bricks and brickbats laid flat.

The roofs of houses were covered with tiles. The tiles were provided with a hole in the top right corner and a number of grooved channels running length-wise. Through these holes, tiles must have been attached to one another and collectively to the wooden or bamboo frame of the inclined roof.

It is not known whether houses had more than one storey. Only two staircases came to light at Kausambi. Because these staircases are of only two steps they might have led only to a platform facing the road.

The main door of houses was 1.20 to 1.50 m. wide. The other doors were generally 0.75 m. wide.

During the NBPW period, an elaborate drainage system came into use. At Hastinapura (Lal 1954-55 : 16) a drain was found 1 m. below the then surface

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level. It was provided with a brick floor and lining. The dimension (0.75 m. deep and 0.40 m. wide) of the drain suggests that it was meant to drain out refuse water from a sizable part of the town. Individual houses had their own soakage arrangement. Several long jars were placed vertically, one above the other, in a deep pit and the bottom of every jar was perforated so that water could pass down freely. Ring wells have also been found. Made of terracotta, the rings measured about 0.60 m. in diameter, 12 to 15 cm. in breadth and 5 cm. in thickness. The number of rings in a well ranged from 10 to 50. It is likely that shallower wells were used as refuse pits while the deeper ones were wells in the real sense of the term.

Some of the settlements were fortified with a mud or brick wall and moats were constructed encircling it. The fortification wall at Kausambi was provided with guard-rooms, towers and gates at regular intervals.

Technology

During the NBPW period considerable progress was made in technology. We find a variety of tools, weapons and other objects in copper, iron, gold, silver, bone and stone.

Copper

Copper objects are found from many sites and they consist of chisels, knives, borers, pins, needles, antimony rods, nail parers, ferrules, reels and bangles. Arrowheads and spearheads have not been found in copper.

Bhardwaj (1979 : 75-106) has chemically analysed 10 copper objects (6 from Rajghat, 2 from Taxila, and one each from Mathura and Ayodhya). The analysis shows that seven of them are of pure copper. The copper content in them is as high as 94.77% to 98.4 per cent. The balance (1.6 to 5.23%) is distributed among impurities like iron (0.21-2.23%), nickel (0.08-1.07%), lime (0.56-2.46%), magnesium (trace to 0.84%) and sulphur (trace to 0.75%). The remaining three objects are of bronze, and tin (1.82-13.99%) has been used as an alloy.

The impurity pattern of all the ten objects shows that perhaps chalcopyrite ore was the source of the metal.

Chemical analysis of the above objects suggests that high temperature furnaces were in vogue and flux was added to facilitate the fusion of metal and removal of gangue material. The presence of 5.9 per cent of calcium oxide in slags from Rajghat indicates that probably lime was used as flux. The presence of slag particles in the metal indicates that a clear separation of the slag and molten metal did not take place.

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Iron

Iron objects are not only more numerous but also exhibit a great variety in forms, in comparison to the PGW period. Iron objects recovered from Hastinapura, Ahichchhatra, Atranjikhera, Mathura and Kausambi can be grouped under the following categories :

(a) Agricultural implements and tools of craftsmen—axes, adzes, chisels, hoes, sickles, and screw rods.

(b) Weapons—arrow-heads, javelin-heads, and spear-heads.

(c) Miscellaneous objects—knives, handles of different kinds, hooks, nails, rivets, fishplates, rings and miniature bells.

From Kausambi as many as 1,115 iron objects were found from deposits dated between 800 B.C. and 550 A.D. Of these 678 were sufficiently well preserved for typological identification. They comprised of 370 arrowheads, 58 spears and javelins and 250 axes, adzes, knives, razors, chisels, sickles etc. (Sharma 1960 : 45-46). An idea of the variety of weapons produced during the NBPW period can be had from the fact that there are no less than 11 types of arrow-heads.

Chemical and spectrographic analysis of 6 objects and metallographic analysis of 4 objects from Rajghat carried out by Bhardwaj (1979 : 141-65) show that in the objects silica, alumina, lime and mangnesia are invariably present besides sulphur and oxides of phosphorus. The presence of these elements in iron indicates that the objects were malleable and could be welded. They would not have hardened greatly when cooled. The objects seem to have been carburized during forging. Bhardwaj thinks that the specimens were probably made by forging the spongy iron produced by direct reduction of oxide ores like heamatite or mangnetite.

The limited information available does not tell us about the use of flux for removing the gangue material during the smelting of ores. The chemical analysis of slag from Rajghat shows that no flux was used (Bhardwaj 1979 : 153). The occurrence of slag particles in the metal indicates that it was perhaps difficult to maintain a minimum temperature of 1180°C (necessary temperature required for liquation of slag) for a long time and that has resulted in the retention of some slag particles in the metal. Except for this, the metal is quite pure. Banerjee (1965 : 178-79) has reported the use of calcium compound as flux at Ujjain but no chemical analysis of any iron object has been reported by him.

One of the objects from Rajghat (Bhardwaj 1979 : Table 41, No. 6) has a high content of carbon which shows that the object cannot be of wrought iron. In answer to this question as to how this extra carbon was incorporated Bhardwaj

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explains that probably the practice of carburization (heating the object at a high temperature—minimum 1500°C—in the contact of carbon) was in vogue.

Silver

The use of silver is known in the form of punch-marked coins which occur in the mid phase of NBPW.

Chemical and metallurgical analyses of these coins have been carried out by Sahni (1945), Prakash and Singh (1968) and Bhardwaj (1979). Chemical analysis shows that copper (13-32%) was alloyed with silver, not only to harden the metal but also to decrease its melting point. Due to addition of copper (1 to 28%) the melting point of silver decreases from 960°C to 780°C. Other elements that are present as impurities are sulphur, lead, tin, nickel, cobalt, arsenic and antimony.

Metallographic examination of coins shows that the metal was free from slag particles and this suggests that the metal was cast when molten. The coins do not show any trace of cold work except a minor amount of compression.

Gold

The only evidence of gold is a bead from the structural Period I B at Kausambi dated to about 300 B.C. (Sharma 1969 : 113). The metal has 2.0 per cent of silver as an alloy.

Glass

Glass was one of the most common materials used for beads and bangles during NBPW period. It is found in several colours like blue, blue-green, black, copper-red, yellow and violet, the last two being rare. Blue glass occasionally contains impurities which float like a red and purple mass in the glass. The colouring agent seems to have been copper and its oxides; cobalt being used for fewer specimens (Sharma 1969 : 114).

Surface Treatment of NBPW

Several attempts have been made to solve the mystery behind the superb lustrous surface of NBPW (Sana Ullah 1946; Lal *IAR* 1955-56, 1959-60; Hegde 1962, 1966, 1972, 1975; Bhardwaj 1969, 1979).

Sana Ullah opined that the 13 per cent of ferrous oxide present in the NBPW surface is responsible for its lustre. According to him some ferrugenous compound was applied on the pots before they were fired, and the black colour was produced by firing them in reducing conditions. The shining surface may be

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due to polishing before and after firing. Dr. B.B. Lal says that the lustre on the surface of the NBPW is due to some easily fusible organic material, and the blackening was achieved by some sort of post-firing treatment. He thinks that some liquid such as oil or plant juice or similar organic concoction was applied on the pottery when it was still hot from the kiln.

Hegde's studies show that magnetic oxide of iron is responsible for the NBPW black colour and the formation of the glass-like surface and soda alumina silicate for its lustre. Hegde reproduced some NBPW sherds in the laboratory. He says that the shine was produced by an application of liquid clay, quite similar to that employed in the preparation of the body of the ware which contained fine ground red ochre (Haematite) and *sajjimatti*. *Sajjimatti* is a natural alkaline efflorescence profusely found in the Ganga plains. Red ochre in such peptized clay liquids, used as surface-dressing on pottery, gives a black shining surface when the pottery is baked under reducing conditions.

The results of Bhardwaj's experiments are contradictory to those of Hegde. According to Bhardwaj, NBPW slip is due to the presence of carbon and because of haematite.

Material Culture

A large variety of ornaments, terracotta human and animal figurines and miscellaneous objects show a flourishing arts and crafts. The material culture of NBPW can be studied under following headings :

Ornaments

Beads are the most prolific objects among the ornaments. They are found in agate, jasper, carnelian, chalcedony, garnet, beryl, crystalline quartz, glass, faience, clay, copper, gold, shell and bone. The most popular material was glass. The common shapes of beads are circular, spherical, biconical, cylindrical, barrel, and square. Some beads have been etched also. Bangles are found in terracotta, faience, glass, shell, stone and copper. Special interest was attached to copper bangles which were provided with a series of holes and rivets, perhaps for adjustment. Finger rings have been found in copper, iron, horn and clay. Pendants have also been found in terracotta, agate and carnelian.

Kitchen Objects

Among the kitchen objects pestles and querns are the most common. Pestles are found in stone as well as fired clay. Circular stones for rolling *chapatis* (bread) are also found.

Terracotta Figurines

We find a large variety of terracotta human and animal figurines. A

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majority of the human figurines are cast in moulds. Only in rare cases do we find extra decoration added after they were taken out of moulds. Female figurines were provided with an elaborate head-dress, ear-ornaments, necklaces and girdles. Male figurines are generally plain except for the presence of a head-dress in some cases.

Of special interest are the therianthropic figurines with human face and animal body from Hastinapura (Lal 1954-55 : pl.XXXVI).

Animal figurines are hand modelled but they are well-executed. The elephant seems to have been the favourite animal. Other animals include horse, bull and ram. In the case of elephant figurines, chains as also the richly-decorated seat, was produced by stamps. Modelled with graceful contours, specially the forehead, tusks and the trunk, it was profusely adorned with impressed designs of the *chakra*, leaves and circles. Other animals are generally plain except with occasional minor decorations, accompanied by straight lines on the body.

The most remarkable feature of many of these terracotta figurines of the NBPW period is their complete stylization and standardization.

Miscellaneous Objects

Among the miscellaneous objects, terracotta toy-carts are the most notable. These are made in moulds. Other objects are simple and animal-headed gamesmen, terracotta discs, balls, flesh-rubbers, and potters' stamps. Seals and sealings are also found bearing legends in Brahmi script.

Subsistence

The evidence for grains cultivated during the NBPW period comes from Atranjikhera (Chowdhury *et al.* 1977 : 63-64), Purana Qila (*IAR* 1972-73 : 67) and Radhan (Lal 1978). Atranjikhera has yielded rice (*Oryza sativa* L.), wheat (*Triticum compactum* host), barley (*Hordeum vulgare* L.), and *urad* (*Phoseolus mungo* L.). From Purana Qila comes the evidence for millet. From Radhan in district Kanpur rice, wheat, barley, pea (*Pisum arvense*) and an unidentifiable cotyledon of legume were recovered from an exposed section of the mound associated with sherds of PGW and NBPW.

Thus we see that besides rice, wheat and barley, millet, pea and *urad* also came to be cultivated during NBPW period. The latter three grains have not been found so far in the context of any preceding cultures in the doab.

The meat of horse, cattle, sheep, goat, pig, deer and fish formed an important part of the diet. The bones of these animals bearing a sharp, cut mark have been found at Hastinapura (Lal 1954-55 : 107-20).

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Trade

Specialization and localization of industries are sufficient cause for trade development. A large variety of copper, iron, and semi-precious stone objects are found associated with the NBPW culture. Neither metal ores nor semi-precious stones are found in the doab region. The finished objects and raw material were imported from neighbouring regions. The import of finished objects seems to be more likely as at the sites we do not find much waste.

The clearest evidence for trade is found in the case of beads. Several examples of "eye beads" of stratified glass reported from Taxila (Marshall 1951 : 102-3) have similarities with beads found at the sites in Mediterranean and Central Asian countries (Beck 1941). Bead No. 263 of Taxila, coming from the level dated to 3rd century B.C. is comparable to beads from Corsica datable to 5th century B.C. Bead No. 265 from the same site, dated to 5th century B.C. is also identical with some Corsican beads and in this case the chronological agreement is better than in the previous one. The corrosion of the central spot and the dark ring of the eye makes the cobalt blue specimen (bead No. 268 of Taxila) look brown. Such a phenomenon has been noticed on the beads found at Thorios in Sardinia datable to 5th century B.C. Considering these similarities, Beck (1941 : 23-25) opined that "eye beads" found at Taxila came from the Mediterranean region.

At Sravasti (Sinha 1967 : 61-63) three specimens of "eye beads" were found in a stratum datable to 5th century B.C. Sinha feels that these beads are non-indigenous and were imported from West Asia via Taxila. From Kausambi, also, several such beads were found from the levels dated 6th-5th centuries B.C. (Sharma 1969 : 105-12).

The "leech-shaped beads" from all the levels of Taxila, dated between 600 and 300 B.C., were probably introduced from Western Asia where they were popular right from the 6th century B.C. to the early centuries of the Christian era (Dikshit 1952 : 38). Similar leech beads have been found from Sravasti (Sinha 1967 : 62), Rajghat (Narain and Singh 1976) datable to 600-300 B.C.

From Sravasti a long cylindrical bead of lapis lazuli has been reported from the early levels of Period I dated to about 600 B.C. (Sinha 1967 : 62). Nineteen lapis lazuli beads and other objects were found at Taxila coming from levels dated between 600 B.C. and 200 B.C. The main source of lapis lazuli in India right from Harappan times has been Badakshan in Afghanistan (Chakrabarty 1978). It is most likely that the bead found at Sravasti was imported from Taxila.

The "etched beads" also have a wide distribution. Similar spherical agate beads have been found at Taxila and Ahichchhatra datable to 4th-3rd century B.C. at both sites (Dikshit 1952). A long barrel shaped 'etched bead' of agate from

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Ahichchhatra (Dikshit 1952 : No. 23) is very similar to the carnelian and agate beads found at Taxila (Beck 1941). Similar to these "etched beads" from Taxila and Ahichchhatra, beads have been found at Kausambi (Sharma 1952 : 106), Sravasti (Sinha 1967 : 61-62), and Hastinapura (Lal 1954-55 : 92-93).

One yellow quartz bead of hexagonal shape from Ahichchhatra has several parallels at Kausambi (Sharma 1969 : 110). At both sites they belong to 3rd century B.C.

Besides some of the above specific types, beads of carnelian, agate, chalcedony, garnet and other precious stones in cylindrical, spherical, circular, hexagonal and barrel shape occur at all the sites mentioned above.

This brief summary of bead types found at several sites indicates that there was a movement of finished goods between Taxila, Hastinapura, Ahichchhatra, Sravasti and Kausambi. Among the beads, while types like "eye beads" and lapis lazuli were traded from Taxila to sites in the doab other types were traded to Taxila from doab sites.

Buddhist literature tells us that remarkable progress was made in the field of trade and commerce (Motichanda 1966). The improved knowledge of cultivation and the use of effective iron implements enabled the peasants to produce enough surplus food which could be used for supporting people engaged in other professions. A number of arts and crafts are mentioned in Buddhist literature. Men of the same trade not only congregated in the same localities but also bound themselves together by the formation of corporate organisations known as guilds. The Jatakas refer to 18 standard guilds, those of workers in wood, metals, stone, precious and semi-precious stones, ivory, leather, textiles and the like (Bandyopadhyaya 1945 : 246-52, Sharma 1966 : 62-63; Majumdar 1968 : 599-600). Each guild was presided by a head and had its own laws. The heads of guilds were known as *Setthis*.

Between the 6th and 4th centuries B.C. there started a trade between India and Babylonia, Syria and Sumer. The main exports were textiles, spices and perhaps finished goods of iron and steel. (Adhya 1969; Sharma 1966; Bandhyopadhyaya 1945).

With the rise of Mauryas we see that trade and industry were highly organised and there was considerable development in economic activities. From *Arthasastra* (Book II) it is clear that there was a rigid control of the state on industry and trade. The state had a monopoly on industries like gold, copper, iron, lead, tin, silver, diamond, gems and other precious stones. These were among the main sources of state income.

The Mauryan state regulated trade and industries through a number of offices like superintendents of commerce, (*Panyadhyakshya*) of weights and

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measures (*Pautavadhyakshya*), and mining (*Akaradhyakshya*). The customs duty on the commodities for inland and external trade was collected by the superintendent of toll (*Sulkadhyokshya*) and the weaving industry was looked after by a superintendent of weaving (*Sutradhyakshya*). In the same way there were officers for each department of trade and industry during the Mauryan period.

Transport and Travel

Transport consisted in carts and chariots drawn by oxen, mules and horses, which were also beasts of burden. In Buddhist literature we find the descriptions of long caravans of camels, horses, mules, oxen and buffaloes (Motichanda 1966, Adhya 1966). The occurrence of toy carts and toy cart wheels in the NBPW period at a number of sites in the doab indicates that the cart was a popular mode of transport. A later *Jataka* mentions that around the outer edge of the wheels an iron sheet of about 5 cm. breadth was put to make the wheel strong (Sharma 1966 : 63).

For the period after 6th century B.C., we find regular references in literature to the roads. The *Jatakas* (Motichanda 1966) mention that there were shady trees on both sides of roads, wells and rest houses. The trunk routes were taken care of and ferries maintained by the *Janapadas* through which they passed or where they occurred. The rivers were crossed by rafts and boats.

The major part of the long distance trade was carried along the rivers Ganga, Yamuna and their tributaries. Sailing down from Banaras to Tamralipti was preferred to travelling by road (Bose 1967 Vol. II : 48). Similarly among the cities of Hastinapura, Ahichchhatra, Mathura, Kampilya and Kausambi river routes were used more (Adhya 1966). Water routes were considered comparatively safe, easy and also quick, and hence less expensive than land routes.

Origin and Spread of NBPW

The origin of the NBPW is a matter of dispute. In the upper Ganga plain it is preceded by the PGW and in the middle and lower Ganga plains by the BRW. Similarities of the NBPW can be traced back both in the PGW and BRW ceramic traditions. On the basis of its similarities to the PGW, Lal (1954-55 : 15) opined that the NBPW is just a refined form of the PGW. According to Sinha (1971 : 33) the differences between the two appear to be confined only to surface treatment—the paintings of the PGW giving way to the lustre of the NBPW. He also mentions that the experimental stage between the PGW and NBPW is represented by Black Slipped Ware (BSW) which is an associated ware of the PGW and BRW during their late phase. On the basis of the occurrence of the NBPW in greater quantity and varied colours in eastern Uttar Pradesh and Bihar it has been postulated that the origin of the NBPW lies somewhere in the above area (Agrawal 1971-72 : 35; Dikshit 1971-72 : 37; Ghosh 1971- 72 : 38; Sinha

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1971-72 : 38). On the basis of ferrous and ferric ratio present in the PGW, BSW, NBPW, Gogte *et al.* (1981) suggest that the NBPW is "nothing but PGW with black polished slip applied on its surface".

Sinha (1969 : 180-81) has given an interesting, though not very acceptable, account of the NBPW spread. He thinks that it was not homogeneous but in two widely differing contexts—one earlier and other decidedly later. The earlier spread is represented at sites like Vaisali, Rajgir, Rajghat, Kausambi, Sravasti and Taxila, and the later one is represented at Charsada, Rupar, Mathura, Hastinapura, Ahichchhatra, Ujjain and Navadatoli. The main criteria for this hypothesis is the date brackets he postulated for the NBPW period at various sites. But neither radiocarbon dates nor the stratigraphy supports his view.

His hypothesis of the spread of NBPW cannot be understood even when we apply the trade-route criterion. Ahichchhatra, Hastinapura and Mathura were the cities on the main trade routes from Taxila to Tamralipti. How could the NBPW reach Taxila without passing through Ahichchhatra, Hastinapura and Mathura?

At a majority of the sites beyond the Ganga plains the NBPW has been found in a later context than at the sites in the Ganga plains. The NBPW beyond the Ganga plains was exported and traders and Buddhist monks played an important role in its spread. The final phase of the NBPW spread can be connected with the expansion of the Ashokan empire in the 3rd century B.C.

Early Historic Culture[1]

With the beginning of the NBPW culture itself we come down to the period of well-documented history. But up to the end of 3rd century B.C. we have to depend on Buddhist and Jain religious texts and Sanskrit literature, except for the inscriptions of Ashoka. With the beginning of the Early Historic period coins, seals, epigraphs and copper plates bearing names of kings and narrating several aspects of their reigns become available. However, instead of going into the political, social and religious history of this period we shall confine ourselves to pottery, architecture, technology, material culture, subsistence and trade and industry only.

By this period almost the whole of northern India was well-populated. It is not possible to enumerate the total number of settlements, like in the case of previous cultures, but the density can be visualized by the fact that in an area of about 6,100 sq. km. in Kanpur district as many as 141 sites of this period were located.

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1. The term Early Historic Culture has been used here strictly for the period represented by Red Slipped Ware, which coincides with Sunga-Kushan periods.

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The first site of this period excavated in the doab was Bhita, near Allahabad by Sir John Marshall in 1911-12. Following this D.R. Sahni excavated Kausambi in 1921-22 but his excavation was of a very limited nature, being confined around the Ashokan pillar only. After this the site of Ahichchhatra was excavated from 1940-44 by A. Ghosh (Ghosh and Panigrahi 1946), followed by Kausambi by G.R. Sharma (Sharma 1960, 1969), Hastinapura by B.B. Lal (Lal 1954-55), Atranjikhera by R.C. Gaur (Gaur 1967), Sonkh by H. Haertal (*IAR* 1970-71 : 39-40, 1971-72 : 47-48, 1972-73 : 33-34) and Mathura by M.C. Joshi (*IAR* 1973-74 : to 1976-77) to name just the important ones. Unfortunately only a few of these excavations have been published in full. We have to depend mainly on the excavation reports of Bhita, Kausambi and Hastinapura.

Pottery

During the Early Historic period there was no exclusive pottery industry like the PGW and NBPW. The variety in the table-ware found in the PGW and NBPW is absent, perhaps because of the greater use of metal vessels.

Early Historic pottery consists totally of red ware. The pots are wheel-made and generally have a medium-grained fabric. They have a wash or thick red slip. Following are the main types (Fig. 16).

1. Bowl with incurved rim (No. 4).
2. Knife edged bowl (Nos. 5, 7).
3. Lid with button like knob (Nos. 8, 11).
4. Lid like ink-pot (No. 12).
5. Bottle-shaped sprinkler (Nos. 15-16).
6. Spouted basin (No. 21).
7. Miniature vase (Nos. 17-20).
8. Big vase (Nos. 24-26).

Stamped and incised designs are found on pottery, mainly on the outer surface. The principal designs are swastika, triratna, loops, circles, simple lines, leaves and flowers. Painted designs, present only on some pots, are executed in black over a bright red surface, and include geometric motifs mentioned above, fishes and birds.

Architecture

Houses during this period were made of mud bricks as well as burnt bricks with an average size of 37cm. × 23cm. × 7 cm. For flooring, thicker and square bricks of 28 cm. × 28cm. × 10 cm. and brickbats were used. Houses were generally oriented

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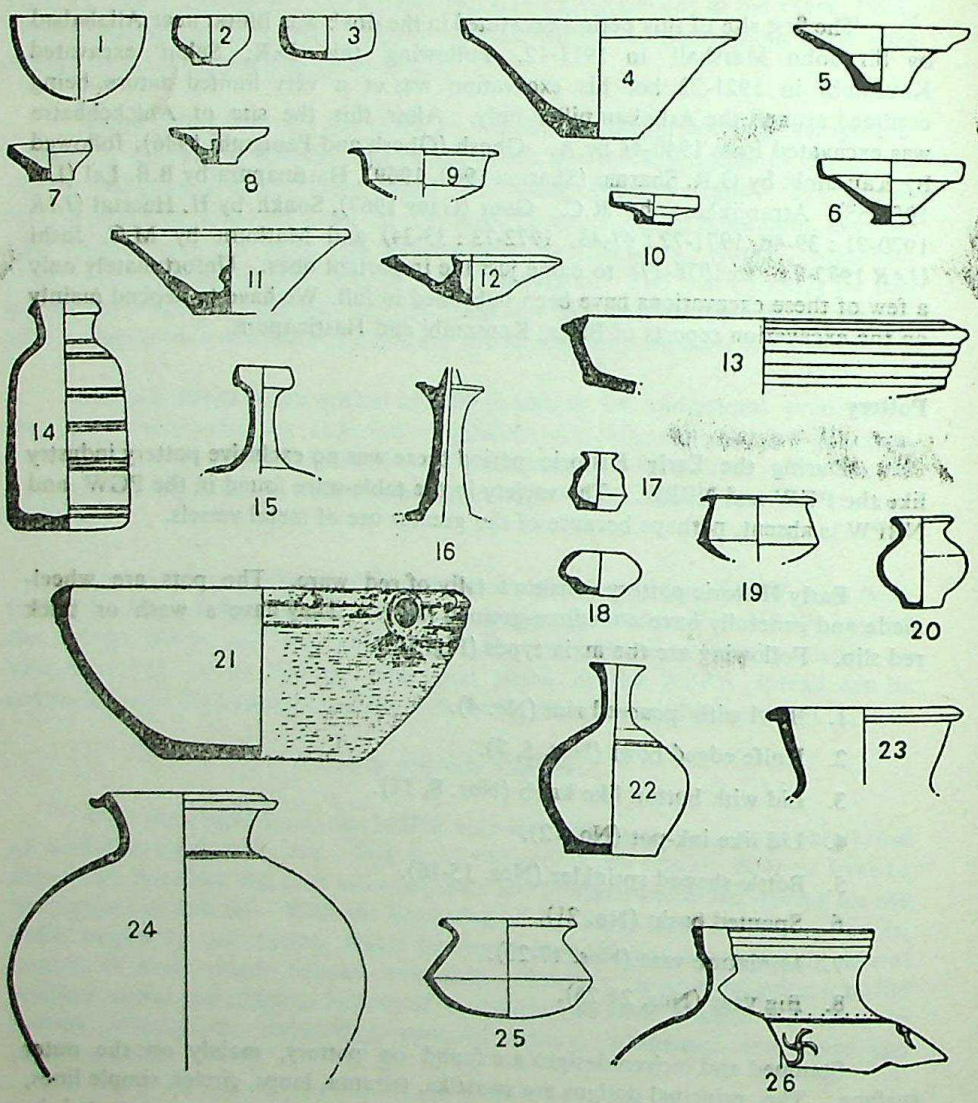

FIG. : 16.

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approximately along the cardinal directions. They were aligned in rows and faced the main road or lanes. Binding material for bricks was mud and, in rare cases, lime. Old foundations were often utilized in building new structures.

Six houses of this period were exposed at Kausambi (Sharma 1969 : 29-31). Although they had individual features, the basic plan of all houses was the same. They consisted of two apartments—inner and outer—probably used by women and men respectively. The number of rooms in the inner apartment was greater than in the outer apartment.

No superstructures were found in excavations. The occurrence of tiles at Kausambi and Bhita would suggest tile-roofing. The width of doors was determined by their situation. The main door of the house was 1.20 m. to 1.45 m. wide. Other doors measured about 0.75 m. The small doors had probably only one leaf.

Both ring wells and soakage jars were used in the drainage system. Ring wells, made of terracotta rings of an average height of 15 cm. placed upon one another were most commonly used to drain off water from houses. The ring wells had an average diameter of 0.75 m. Big jars were also used for making drainage wells.

A few tanks, made of burnt bricks and measuring 2 m. ×2 m. to 2 m. ×3 m. have also been found at Kausambi (Sharma 1969 : 36-46). Sharma thinks they were septic tanks.

One of the most important structures of this period is a temple belonging to 1st century B.C. from Mathura (*IAR* 1971-72 : 47-48). The excavation revealed a complete outline of the temple. The cellar was found to be surrounded by bases of 15 brick pillars. The temple itself shows two structural phases; of these the lower one, preserving the full outline, is built of 48 cm. ×23 cm. ×7 cm. size mud-bricks, while the upper one is seen only near the entrance side on the east, where remains of a baked brick superstructure were found. The superstructure along with fifteen pillars belongs to a later phase of the temple. The temple is situated on a platform which was bounded by a brick wall. The measurements of the temple are as follows : diameter of apse 3.80 m; length of apsidal temple 7.30 m.; entrance opening 1.60 m., framed by a 1.10 m. broad wall-pillar each to the left and right sides; distance between edges of the apsidal wall 0.85 m.; the distance between the two pillars 1.20 m. to 1.40 m.; and the size of platform on which the temple is built 15.0 m. by 11.50 m. The wall structure protruding underneath seems to have been covered by an artificial slope. South of the apsidal temple, at a distance of about 5.0 m. from the platform were found fragments of a stone railing. Likewise east of the temple, some pieces of a gateway came to light. These obviously had fallen when the gateway collapsed. This points to the fact that the apsidal temple was provided, at least on its southern side, with a stone railing and on the east,

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a gate of three architrave-type. The line in which the *stambha fragments* and *suchis* were found, supports the assumption that the railing had a straight course.

Technology

Copper and iron technology seems to have remained at the level of the NBPW period. The types of metal tools found during this period are the same as those of the NBPW period. Iron was the most commonly-used metal. The lack of scientific studies of metal objects precludes a knowledge of metallurgy in this period.

In copper only small tools like chisels, knives, borers, pins, antimony rods and needles are found. Ornaments include only bangles and rings. From the site of Ganwaria (*IAR* 1976-77 : 52) and Bhita (Marshall 1911-12 : 89-90) bowls have been reported.

Tools and other objects in iron show a greater variety and can be classified in the following categories :

Agricultural implements and tools of craftsmen—axes, adzes, hammers, ploughshares, hoes, chisels, sickles, clamps and screw-rods.

Weapons—arrow-heads, javelins, spear-heads and their sockets.

Miscellaneous objects—nails, bars, handles of different kinds, seals, rivets, door hinges, fish-plates, knives, hairpins and miniature bells.

Glass was used most extensively for making beads and bangles.

Gold was introduced for the coins by the Kushanas. No gold ornaments have been found. Silver was used only for ornaments. So far only one silver Kushana coin has been found (Puri 1965 : 214).

From Ganwaria (*IAR* 1974-75 : 41) an anvil has been reported but its metal is not mentioned.

Material Culture

Ornaments

Among ornaments, as before, the most common item is beads. They are found in terracotta, agate, chalcedony, crystal, glazed quartz, yellow quartz, faience and garnet beryl, amethyst, jasper, lapis lazuli, shell, bone and copper. Beads of glass are found in several colours like blue, green, black, copper-red, orange, yellow and violet. The most popular shapes are spherical, circular, oval, cylindrical, barrel and multifaceted. Pendants of carnelian, amethyst, yellow

quartz, glass, shell, bone and copper are found. Bangles are found in glass, shell, ivory, terracotta and copper. Nose-rings and finger rings have also been found in copper. Only one finger ring of gold has been found from Hastinapura (Lal 1954-55 : 92). From Ganwaria (*IAR* 1976-77 : 52) a silver ear-stud has been found.

Kitchen Objects

The most commonly found kitchen objects are pestles and querns of stone as well as baked clay. Frying pans (*tawa*) have been found at Hastinapura (Lal 1954 55 : 99) and Kausambi (Sharma 1969 : 103). At Kausambi a ladle has also been found. At Bhita (Marshall 1911-12 : 89-90) and Ganwaria (*IAR* 1975-76 : 49-50) copper bowls have been found.

Terracotta Figurines

Terracotta figurines of this period were both hand-made and moulded. Animal figurines are generally hand-made whereas human figurines are moulded. While the former variety was comparatively crude, the moulded figurines represent the terracotta art at its zenith. The stylization and standardization was so complete that the terracottas found at distant sites such as Rupar, Hastinapura, Ahichchhatra, Mathura, and Kausambi are almost identical. From a standardization of dress, ornaments, decoration, general pose and expression of the body, it is clear that the coroplast was trying to translate into clay a well-defined formula sanctioned by long usage and convention.

Human figurines, both male and female, are heavily ornamented. They share a family-likeness in dress, ornaments, and decorative motifs with contemporary stone sculptures. Coomaraswamy (1920), Gordon (1943), and Agrawal (1948) think that the terracottas of the Early Historic period show an influence of Hellenistic art.

In contrast to the human figurines, animal figurines show a lesser degree of skill, or at least less care, on the part of their makers. While the body was invariably modelled by hand, stamps were sometimes employed to shape the head and limbs (Lal 1954-55 : Pl. XLV, Sharma 1969 : Pl. XLIB). In the case of some figurines the horns were first made by hand and later shaped by the use of stamps. In the case of elephants richly decorated seats and chains were produced by stamps; feathers of birds and manes of horses are indicated by oblique incision.

Animal figurines are mainly of elephant, horse, camel, bull, ram, rhinoceros, deer, wild boar and fox. Water animals are represented by tortoise, frog, and fish. Among the birds represented, are peacock, dove, owl, woodpecker and crane.

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Stone Sculpture

In northern India, under the Kushanas, Mathura and Sarnath became the most important centres of stone sculpture. The different native currents were amalgamated by sculptors. They carved out beautiful sculptures of Buddha-Bodhisattva, the Brahmanical divinities like Vishnu, Surya, and Siva, Jain Tirthankaras, Kuberas, Yakshas and Nagas with their female counterparts. The art retained its non-sectarian character. It served the end of all the three religious cults—Buddhism, Jainism and Brahmanism.

Besides the sculptures connected with religious sects, we find the statues of kings, noblemen and common men and women. Of these the most notable is the statue of the Kushana king, Kaniska, found in 1911 at the ancient site of Mat, 14 km. north of Mathura (Vogel 1911-12 : 122).

Architectural pieces like *torana*, friezes, railings, cross bars, basements, pillar-slabs, door-jambs and capitals carry beautiful carvings in stone. They depict scenes of daily life. Bacchanalian scenes are not devoid of sensuousness which is a characteristic feature of Kushana art. Nudity, eroticism, dancing and music are faithfully depicted. Nude and semi-nude females accompanied by their lovers, trees and birds, like parrots, are also portrayed in a sensuous manner. Coomaraswamy (1927 : 64) opined that they are not the ordinary women but yakshinis, nymphs and dryads regarded as an auspicious emblem of fertility.

Miscellaneous Objects

Among other objects of this period mention may be made of terracotta toy carts, wheels, reels, discs, balls, gamesmen and votive tanks. A terracotta boat has been found at Atranjikhera (*IAR* 1967-68 : 46). From Kausambi (Sharma 1969 : 97) and Mathura (*IAR* 1975 : 55) ivory stands have been found. They were possibly used as mirror or lamp stands. Toilet-caskets made of steatite are very common. They comprise bowls, dishes, lids, stoppers and small vases.

Subsistence Pattern

Though no cereal and other grains have been reported from the sites of the Early Historic period, it can be presumed that the food habits of the NBPW people continued.

An inscription of Huviska found at Mathura (Konow 1931-32 : 56-61) mentions articles of food to be given daily to the hungry and thirsty. They include barley meal (*saktu*), salt (*lavana*) and flour (*saktu-saktu*) and some green vegetable.

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Evidence furnished by the literature is most exhaustive (Puri 1965 : 97). Articles under the categories of cereals, pulses, fat, sweets and meat suggest lavish meals. The cereals included barley, wheat, rice, fried and parched grains; oil : seeds of mustard and *til*; and pulses : *arhar*, *moonga* and *masha*. The fat included milk, *ghee* and oils. Sweets were prepared from rough sugar (*guda*) or candy (*sarkara*). The flesh of a number of animals and fish formed part of their food.

Trade and Industry

After the fall of Mauryan empire, the state control over economy was considerably reduced. The arts and crafts had witnessed a remarkable growth during the Early Historic period (Sharma 1966, Adhya 1966). People working in the same trades were organised into guilds. In the literature of this period we find a reference to 18 guilds (Puri 1965 : 106).

Goldsmiths (*Sauvanikas-hairanyakas*), makers or sellers of cloaks (*pravarika-pali* : *pavarikas*), jewellers (*mani prastarakas*), perfumers (*gandhikas*), oilmillers (*tailikas*), makers of pots for storing ghee (*ghrita kundikas*), makers of molasses (*golikas*), cotton cloth makers (*karpisika*), makers of candy sugar (*khandakarakas*), sweetmeat confectioners (*modaka karakas*), wheat-flour dealers (*samita karakas*), grinders of barley meal (*sakti-karakas*), dealers in perfumed oil (*gandhakailkas*), provision dealers (*attavanijas*), weavers (*kolikanikayas*), potters (*kulairikas*), bamboo workers (*vasakaras*) and braziers (*kamskaras*).

The guilds had their own law and the head of a guild was known as *sresththin*.

One of the most important developments in the field of commerce during the Early Historic period was the brisk trade with Rome. In the beginning this trade was through land routes but with the movement of Sakas, Kushanas and Parthians, land routes were almost abandoned. And from the first century A. D. onwards, trade was mainly sea-routed.

India and Rome did not trade in articles of daily or common use. Warmington (1928) lists items that were traded between the two countries. The chief items of export from India were spices, perfumes, medicinal herbs, pigments, pearls, precious stones like diamonds, sapphires, turquoise and lapis lazuli, iron and steel, copper, sandalwood, cotton cloth, silk yarn, muslin, indigo, ivory. The main items of import were thin cloth, linen, perfumes, medicinal herbs, vessels of glass, silver and gold, wine and coral.

Transport and Travel

Large scale trade during this period required well defined routes and good means of transport. *Avadana Sataka* (LXXXVIII. II. 103) refers to traders going

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to the east and south from Madhya Desh. Sravasti and Kausambi were well-connected with Sopara, a port town in Maharashtra. Taxila was connected with Hastinapura, Ahichchhatra, Sravasti on one hand and Mathura, Kausambi and Ujjainy on the other. The internal lines of communication not only covered the whole of India but extended as far as Balkh and Khotan, meeting the famous silk route between China and Rome.

Long-distance means of transport were chariots and carts. A considerable amount of material was carried by camels, horses, mules and cattle. The sea trade was carried in big boats and ships. It has been supposed that the Pali word "*macchayantra*" denotes mariner's compass (Bose 1967 Vol. II : 55).

Chronology of the Cultures in the Ganga-Yamuna Doab

Though the stratigraphic sequence of the cultures in the Ganga-Yamuna doab is now well established, the absolute chronology still remains debatable. Forty-five radiocarbon dates from 8 sites in the doab are now available and normally they should suffice for establishing the chronology of various cultures. But, because of the erratic nature of many dates, archaeologists differ in their interpretation.

When Lal excavated Hastinapura from 1950-1952 the radiocarbon dating facility was not available in India. To fix the chronology of the cultures at Hastinapura, in particular, and in the Ganga-Yamuna doab, in general, Lal used stratigraphic and literary evidences (Lal 1954-55 : 21-23). He suggested the following date brackets for different cultural periods :

1. Ochre Coloured Pottery—Period I= pre 1200 B.C.
2. Painted Grey Ware—Period II=1100 to 800 B.C.
3. Northern Black Polished Ware—Period III=Early 6th century B.C. to early 3rd century B.C.
4. Early Historic—Period IV=Early 2nd century B.C. to the end of 3rd century A.D.

Gordon (1957) and Wheeler (1959) did not agree with Lal's chronology and suggested new date brackets after reviewing the evidence obtained from Hastinapura. Gordon suggested pre-800 B.C. for Period I, 750-450 B.C. for Period II, and 350-50 B.C. for Period III. Wheeler suggested pre-800 B.C. date for Period I, 800-500 B.C. for Period II and 500-100 B.C. for Period III. New dimensions to this controversy were added when C-14 dates became available for different cultural levels at Hastinapura and a number of other sites. On the basis of C-14 dates Agrawal (1971 : 107-08) suggested a date bracket of 800-400 B.C. for Period II and 550-100 B.C. for Period III.

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In the following pages we will examine the various chronologies in the light of (1) stratigraphy and (2) radiocarbon dates. In the discussion we shall proceed from the Early Historic backward to the Late Harappan period, because the Early Historic period can be more securely dated on the basis of coins, epigraphs and literary sources.

Before proceeding with the evaluation of the various chronologies it will be useful to mention some problems connected with radiocarbon dates. Radiocarbon dating method has been a boon to archaeology and the near total dependence of archaeologists on this method is best expressed by Glyn Daniel (1970 : 3) when he says "We are not only the benefactors of radiocarbon dating : we are the slaves of its priests." In recent years, however, the blind faith in C-14 dates has begun to be questioned (Pilcher and Baillie 1978 : 217). Thus, while dealing with C-14 dates we have to keep in mind several problems connected with and also that C-14 dates are not precise statements of the age of samples but estimates of probability (Thomas 1978: 232). It is unlikely that we will get uniform dates for the beginning and end of a culture from all parts of its geographical area. C-14 dates should be seen in the context of stratigraphy and geographical setting of the sites. In the case of majority of the excavated sites detailed reports are not available, thus making it difficult to put the dates in precise stratigraphic context.

In the following discussion calibrated dates (according to Ralph *et al.* 1973) have been used but standard dates (based on 5,730 years half-life) have also been given.

Early Historic Period

For the Early Historic period we do not have any exclusive C-14 dates. Whatever dates are available, are included in the NBPW period. But for this period we have a large number of coins, seals and sealings and epigraphs. Though these have been found at almost all the excavated sites we shall consider here the evidence only from Hastinapura and Kausambi because in both the cases detailed reports are available and the chronological order of the coins, seals and sealings is well known.

At Hastinapura the Early Historic period is represented by Period IV of the site (Lal 1954-55 : 17-19, 22). Two inscribed pot-sherds, one seal and several coins were found from this period. One inscribed sherd from the lower levels of this period has been dated on palaeographic basis, to 2nd century B.C. while another pot-sherd and a seal coming from the upper levels have been dated to 2nd century A.D.

Coins have been found from almost all levels. From the lower levels, five coins of the Mathura rulers were found. Of these, two were of Seshadatta.

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Although no absolute dates can be fixed for the Mathura rulers, it is agreed that they ruled during 2nd century B.C. (Smith 1906 : 192; Sircar 1968 : 171). From the middle levels, "bull and elephant" type of Youdheya coins were found. According to Smith (1906 : 165), Sircar (1968 : 165-68) and Saran (1972) these may be dated a little before or after the Christian era. Associated with upper levels ten imitation coins of the Kushana king Vasudeva, were found. The reign of King Vasudeva has been dated between 145 and 176 A.D. (Sircar 1968 : 151).

Thus at Hastinapura the Early Historic period can be securely dated between 200 B.C. and 200 A.D.

At Kausambi the Early Historic period is represented by Period III (Sub-Period (S.P.) III-VIII, layers 8-1) of the site (Sharma 1969 : 15-23). From the early levels of this period (S.P. III, layer 8) one coin of Brahaspatimitra was found. On the basis of palaeographic and other historical evidence this coin has been dated to the later half of the 2nd century B.C. From S.P. IV (layers 7 and 6) and S.P. V (layers 5 and 4) besides uninscribed copper cast coins, coins of the second Mitra dynasty bearing names of Prajapatimitra, Suramitra, Rajmitra, Rajanimitra and Jyesthamitra were found. All these kings of the Mitra dynasty ruled between 1st century B.C. and 1st century A.D. (Sircar 1968 : 172). In layer 4, coins and seals of the Kushanas dated between 50 B.C. and 150 A.D. were also found. S.P. VI (layer 3) yielded a large number of coins of the Kushanas, Neva and Magha rulers. Sharma (1969 : 19-20) opines that the occurrence of all these coins together represents the period when Kausambi was wrested from the Kushanas by the local Magha rulers. In S.P. VII (layer 2) coins of only Magha rulers were found. On the basis of these coins S.P. VI and VII can be dated to 100-200 A.D.

The terminal date for the period was provided by the coins of Ganendra or Ganpatinaga found in S.P. VIII (Layer 1), only 10 cm. below the surface. It is, therefore, certain that at the time these coins were deposited the occupation of S.P. VIII was almost over. Thus, the end of the period can be put sometime around 300 A.D.

Thus, we see that the evidence of coins found at various levels at Hastinapura and Kausambi suggest a date bracket of 200 B.C. to 300 A.D. for the Early historic period.

NBPW

The upper limit of 300 B.C. for NBPW at Hastinapura was based on the occurrence of Seshadatta's coins in the early levels of Period IV and one hundred years were given for the gap between Period III and IV. The deposit of this period at Hastinapura mound I was 1.50 to 2.75 m. and at Hastinapura mound II about 3.0 m. Lal distinguished 6 sub-phases in Period III and assigned 50

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years for each sub-phase. He substantiated his argument by correlating the Hastinapura evidence with that of Taxila and Kausambi.

At Taxila, 21 sherds of NBPW were found in Marshall's excavations (Wheeler and Deva 1946). Of these, 3 sherds came from Sirkap and 18 from the Bhir mound. Of the three sherds from Sirkap, 2 came from the lowest level of the site ascribable to the 2nd century B.C. while the third was found on the surface. Of the 18 sherds from the Bhir mound one was found between the surface and 1.80 m. depth, while others were found between 1.80 and 3.90 m. depth. The occurrence of Alexander's coins in mint condition at an average depth of 1.80 m. shows that the level is ascribable to circa 300 B.C. It would therefore follow that the NBPW at Taxila is essentially pre-Alexander and with 2.25 m. of the occupation deposit containing NBPW sherds the ware may well have appeared sometime in the 6th century B.C. However Wheeler (1959 : 30) does not agree with this conclusion because "Taxila was not dug stratigraphically in the modern usage of the term", hence these depths are an unreliable guide for chronology.

At Kausambi (Sharma 1969 : 23) NBPW was found from layer 8 to 16. The total thickness of the deposit was 2.5 m. Considering the date 200 B.C. for layer 7 in which coins of Mitra rulers of Kausambi were found, and 8 occupational layers below, the beginning of the NBPW at Kausambi was placed in early 6th century B.C.

Sinha (1969) divides NBPW into two phases : earlier and later. The earlier phase is represented by sites like Vaisali, Rajgir, Rajghat, Sravasti, Kausambi and Taxila and the later phase by Charsada, Rupar, Hastinapura, Ujjain and Navdatoli. He postulated the beginning of the NBPW at sites in the first category around 500 B.C. and at sites in the second category around 350 B.C. But C-14 dates and coins from sites of his later phase indicate a much higher date for the beginning of NBPW than proposed by him. Further, it is quite unreasonable to compare sites like Vaisali, Rajgir etc. in U.P. and Bihar with distant sites like Taxila Udgram or Navdatoli.

Excavations at Sringaverapura and Ayodhya by B.B. Lal have given us a better picture of the stratigraphy of the NBPW period. Lal (1981 : 131) identified three phases—early, middle and late—in the NBPW period at these sites. The use of punch-marked coins and structures of burnt bricks started in the middle phase which has been dated to 5th century B.C. Considering the 1.0 m. deposit of the early phase Lal postulates that the beginning of the NBPW will go back to the early 7th century B.C.

In a discussion of the chronology of the NBPW on the basis of statigraphy, numismatic evidence has an important role.

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In India the first true coins were the punch-marked coins of silver and copper. In the excavations at Taxila a hoard of punch-marked coins was found along wth two coins of Alexander and one of Philip Aridaeus (Marshall 1960 : 58-9). While the coins of Alexander and Philip Aridaeus were in mint condition, punch-marked coins were very much worn out indicating that they had been in circulation for a considerable time before the advent of the coins of Alexander and Aridaeus (Walsh 1939 : 1-2). The hoard is supposed to have been buried not much later than the time of Philip Aridaeus (323-317 B.C.), as the mint condition of Greek coins shows. The punch-marked coins of the hoard, from their state of preservation, can be taken to have been current for at least a century or even more. These coins from Taxila were assigned to the 4th century B.C. (Ray 1959 : 6). At Rupar, Hastinapura, Purana Qila, Mathura, Kausambi and Ujjain punch-marked coins appear in the mid-phase of the NBPW. Literary evidence shows that by the 5th century B.C. coins were in circulation in India (Agrawal 1953; Altekar 1953; Sircar 1953).

The archaeological and literary evidence leaves no doubt that punch-marked coins were in circulation in the 5th century B.C. and because these coins are coeval to the mid-phase of the NBPW, this phase can be assigned to 5th century B.C. When we add to this the time period given to the early phase of the NBPW by Lal, the beginning of the NBPW goes to the early 7th century B.C.

Now, we shall turn to C-14 dates for the NBPW chronology.

For the NBPW period we have 48 dates from 19 sites, mainly from the Ganga plains. On 9 of these sites the NBPW is preceded by the PGW. This gives us a better chance to examine the accuracy of C-14 dates for both these cultures.

Of 48 dates for the NBPW culture 9 dates have to be rejected on the following grounds :

1. PRL-201 (780±160 B.C.) for the late phase of the NBPW at Bateswar. Because PRL-197 (640±110 B.C.) for the middle phase of the NBPW and PRL-198 (760±90 B.C.) for the late phase of the PGW at the same site are younger.

2. PRL-342 (390-270±160 B.C.) for the early phase of the NBPW at Mathura. Because PRL-340 (490±60 B.C.) and PRL-337 (440±100 B.C.) for the middle phase and PRL-338 (420±110 B.C.) for the late phase of the NBPW at the same site are older and consistent.

3-5. PRL-336 (790±100 B.C.), PRL-334 (800±150 B.C.) for the late phase of the NBPW at Mathura. The excavator of the site, Joshi (1981 : 41-43) says that these dates fit neither in stratigraphy nor in historical chronology.

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Table 2.

C-14 Dates for NBPW

S. No.	*Site*	*Sample number*	*C-14 dates base on 5730 years half life*	*Calibrated dates according to Ralph et al.*
1	*2*	*3*	*4*	*5*
1.	Ahichchhatra	TF-301	370±105	410±105
	—	TF-311	475±105	470-440±105
2.	Atranjikhera	TF-283	260±105	380-210±105
	—	TF-284	295±100	390-270±100
	—	TF-194	530±85	640-500±85
3.	Besnagar	TF-254	295±110	270-390±110
	—	PRL-283	310±140	390±140
	—	TF-287	470±105	460-440±105
4.	Charsada	UW-78	50±70	50±70 A.D.
	—	UW-77	270±60	230-380±60
5.	Chirand	TF-446	35±105	60±105 A.D.
6.	Hastinapura	(L) TF-80	50±115	50±115 A.D.
	—	(L) TF-82	50±115	50±115 A.D.
	—	(L) TF-81	125±100	60-10±100
	—	(E) TF-88	340±115	400±115
7.	Hatimpur	TF-176	105±105	10-60±105
8.	Kausambi	(L) TF-100	275±100	380-240±100
	—	(L) TF-226	220±100	200-170±100
	—	(L) TF-104	270±110	380-230±110
	—	(M) TF-103	410±110	420±110
	—	(M) TF-105	335±115	400±115
	—	(M) TF-225	400±110	420±110
	—	TF-221	500±105	480±105
	—	TF-219	440±100	430±100
9.	Mathura	(M) PRL-336	660±100	790±100
	—	(M) PRL-334	730±150	810±150
	— (L)	(L) PRL-333	610±150	750±150
	—	(L) PRL-343	270±100	380-230±100
	—	(L) PRL-338	400±110	420±110
	—	(M) PRL-337	400±100	440±100
	—	(M) PRL-340	510±160	490±160
	—	(E) PRL-342	300±160	390-270±160

(Contd. on next page.)

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1	2	3	4	5
10.	Purana Qila	PRL-97	105±145	10-60±45
11.	Rajghat	TF-293	490±110	470±110
12.	Rajgir	TF-46	260±100	380-210±100
	—	TF-45	265±105	380-210±105
13.	Rupar	(M) TF-213	260±100	380-210±100
	—	(M) TF-209	485±100	470±100
14.	Sohgaura	PRL-182	240±90	360-210±90
	—	PRL-182 (A)	410±150	420±150
	—	PRL PRL-183	590±110	730-710±110
15.	Takaiapur	PRL-184	180±110	130±110
16.	Ujjain	(M) TF-409	450±95	440±95
17.	Kayatha	TF-674	470±100	450±100
	—	TF-394	495±100	470±100
18.	Bateswar	(L) PRL-201	640±160	780±160
	—	(M) PRL-195	530±110	640±110
19.	Noh	TF-994	686±105	640±105

6-9. All the four dates from Hastinapura. Because the samples are said to have been contaminated (*Radiocarbon* 1964 : 227-28).

Except for these 9 dates all other dates fall in a time range of 700-100 B.C. There are 14 dates coming from the mid-level of the NBPW and these are older than 400 B.C. and show that the mid-phase of the NBPW belongs to 500-400 B.C. and by this time the culture was well established at all the sites mentioned in the table.

Thus, we see that stratigraphy and C-14 dates favour a date bracket of 700-100 B.C. for NBPW.

PGW

Lal (1954-55 : 21-23) dated the PGW at Hastinapura between 1100 and 800 B.C. with a probable margin of 100 years on either side. Since Lal had dated the beginning of the NBPW to 600 B.C. and assigned a period of 200 years to the gap between Period III (NBPW) and Period II (PGW) he put the upper limit of the PGW at 800 B.C. By assigning a duration of 300 years for the 2.20 m. deposit of the PGW he put the beginning of this culture at 1100 B.C. Gordon (1957 : 109) did not find any convincing evidence in the Hastinapura material to push the antiquity of the NBPW beyond 350 B.C. and he thought that 100 years

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were enough to account for the gap between Periods II and III. Thus, by taking 450 B.C. as the date for the end of Period II and assigning 250 years for the 2.20 m. deposit he postulated a time period of 700-450 B.C. for the PGW. Wheeler (1959 : 28) felt that 800-500 B.C. would be an ideal date bracket for the PGW. On the basis of C-14 dates, and the occurrence of a terracotta seal of the Mauryan period in the PGW deposit at Allahpura, Dikshit (1973) and Agrawal *et al.* (1978, 1979) have suggested the duration of the PGW between 800 and 300 B.C.

We shall discuss here first the stratigraphic evidence and then C-14 dates for the PGW to consider its date.

Excavations at Bhagwanpura in Haryana and Dadheri, Kathaplon and Nagar in Panjab have revealed an interlocked phase between the Late Harappan and PGW cultures (Joshi 1977, 1978). At Manda in Jammu-Kashmir (J & K) grey ware, generally found associated with the PGW, has been found interlocked with the Late Harappan culture (Joshi 1979). These sites are several hundred kilometres apart and therefore the interlocking phenomenon represents a wide-spread reality.

This interlocking phase presents us with two alternatives; either the date of the Late Harappan period should be brought down to 8th-9th centuries B.C. or the date of the PGW should be pushed back to 12th-13th centuries B.C. Joshi (1978 : 101) the excavator of these sites gives a time period of 1600-1000 B.C. for the interlocking phase. Sharma (1979) argued a duration of 1200-1100 B.C. for this phase. Suraj Bhan (1964), Fairservis (1971 : 306-14) and Possehl (1980 : 13-21) in their lengthy discussion of the chronology of Harappan culture have convincingly shown that the Late Harappan culture in the region of Haryana, Panjab and western Uttar Pradesh ended around 1200 B.C. If we consider the end of the Late Harappan era around 1200 B.C. and asssign 200 years to the 1.5 m. deposit (using Lal's criterion of 0.75 m. deposit for 100 years) at Bhagwanpura, the antiquity of the PGW would go back to 1400 B.C.

Thus the stratigraphy shows that the PGW sites in Haryana, Panjab and J & K are older than those in northern Rajasthan and Uttar Pradesh. In the region of Haryana, Panjab and J & K, the PGW people existed along with the Late Harappan, but by the time they reached the doab and northern Rajasthan the Late Harappan or OCP cultures were no longer in existence. That is why we do not get any overlap between either of these two cultures and the PGW at sites like Alamgirpur, Hulas, Hastinapura and Ahichchhatra.

On the upper side the PGW overlaps with the NBPW which was well established by 600 B.C. and the overlap phase between the two ranged between 700 and 600 B.C. A terracotta seal, structures of burnt bricks, terracotta figurines, antimony rods etc. have been found associated with the PGW and NBPW

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overlap phase, IB at Allahpura (Dikshit 1973 : 150). The terracotta seal is inscribed in the late Mauryan (c. 236-187 B.C.) Brahmi script. On the basis of these findings Dikshit (1973) suggested that the PGW continued up to 300 B.C. However, at present Allahpura is the only site where the above mentioned items have been found associated with the PGW. Before drawing a firm conclusion from the findings of Allahpura they need to be corroborated from other sites. So far no punch-marked coin has been found associated with the overlap phase of the PGW and NBPW or even with the early phase of NBPW.

The shorter chronology proposed by Agrawal (1971 : 50) depended also, on the association of iron. Though, in the doab the PGW populace, were the first to use iron, in northern Rajasthan iron has been found associated with the BRW (*IAR* 1971-72 : 42). In Haryana, Panjab and J & K iron has not been found in association with the PGW and therefore Tripathi's (1973 : 277) view that the PGW came from iron-using people is no longer valid.

In Table 3 are given 25 C-14 dates for the PGW from 10 sites. Of these 9 came from northern Rajasthan and the rest from western Uttar Pradesh. Unfortunately we do not have any C-14 dates from Haryana, Panjab and J & K.

Before the dates are considered it would be fruitful to cross-check their consistency. Following are the dates that are inconsistent and have to be rejected.

1. TF-1144 (470±90 B.C.) for the late phase of PGW at Noh. Because TF-994 (640±105 B.C.) for the NBPW at the same site is older and according to the excavator (Lal 1980 : 66) these samples belong to disturbed layers and cannot be relied upon.

2-5. PRL-274 (410±110 B.C.), PRL-213 (400±110 B.C.), PRL 212 (410±100 B.C.) and PRL-273 (430±150 B.C.) from Jodhpura. Because PRL-274 comes 0.90 m. below PRL-272 and yet it is 500 years younger than the latter. PRL-213 comes at the lowest depth but gives the youngest value. PRL-273 comes from a lower level than PRL-272 but gives a much younger date.

6-7. TF-287 (300±100 A.D.) and TF-221 (550±110 B.C.) for mid-phase of the PGW at Atranjikhera. Because BM-194 (660-510±150 B.C.) and WSU (640-510±150 B.C.) for the overlap phase between the PGW and NBPW and TF-191 (1155±110 B.C.) for the mid-phase of the PGW at the same site are much older.

8. PRL-317 (380-230±105 B.C.) from Ahichchhatra. Because TF-311 (470-440±105 B.G.) and TF-301 (410±105 B.C.) for the NBPW phase at the same site are older and also consistent. Furthermore, the laboratory report says that the sample for PRL-317 belongs to a disturbed layer (*Radiocarbon* 1966 : 443).

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Table 3.

PGW Dates

Site	*Laboratory number*	*Cultural horizon*	*Standard C-14 dates in B.C.*	*Calibrated dates in B.C.*
Noh	TF-1144	Late PGW	490±90	470±90
—	UCLA-703A	Mid PGW	605±260	745±260
—	TF-993	Mid PGW	725±150	805±150
—	UCLA-703B	Mid PGW	820±225	900±225
Jodhpura	PRL-212	PGW+BRW, Trench D Layer-9, depth 2.6 m.	380±100	410±100
—	PRL-272	PGW, Trench-D Layer-12, Depth 1.97 m.	800±150	900±150
—	PRL-274	PGW, Trench-D, Layer-12, depth-2.9 m.	370±110	410±110
—	PRL-213	PGW, Trench-E, Layer-8, depth-3.5 m.	320±110	400±110
—	PRL-273	PGW, Trench-E, Layer-8, depth-2.5 m.	420±150	430±150
Hastinapura	TF-83	Uppermost PGW	335±115	400±115
—	TF-112	Uppermost PGW	375±100	410±100
—	TF-90	Uppermost PGW	390±115	420±115
—	TF-85	Late-PGW	505±130	485±130
—	TF-91	Late-PGW	570±125	720-660±125
Allahpur	PRL-81	PGW	385±95	415±95
Alamgirpur	TF-51	PGW	890 A.D.	—
Atranjikhera	TF-221	Late-PGW	535±100	650-505±100
—	TF-287	PGW	300±100 A.D.	—
—	TF-191	Lowest layer of Mid. PGW	1025±110	1155±110
Ahichchhatra	TF-317	Late PGW	270±105	380-230±105
Khaluna	PRL-68	PGW	485±170	470±170
—	PRL-1228	PGW	545±100	660-510±100
—	PRL-67	PGW	570±160	720-660±160
Bateswar	PRL-198	Late PGW	620±90	760±90
Ganwaria	PRL-C-14 date list II/1977	PGW	2790±110	—

9-13. All the dates from Hastinapura. Because laboratory report says that samples were contaminated (*Radiocarbon* 1964 : 227-28).

14. TF-51 (890±95 A.D.) from Alamgirpur. Because it is too young.

15. Date from Ganwaria—2790±110 B.C. (PRL-date list II/1979). Because it is too old.

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16. PRL-81 (415±95 B.C.) from Allahpura. The reason has been discussed in detail in following pages.

After this brief assessment we are now left with following 8 dates :

PRL-1228=660-510±100 B.C.
PRL-67 =720-660±160 B.C.
UCLA-703A=745±260 B.C.
PRL-198 =760±90 B.C.
TF-993 =805±150 B.C.
PRL-272 =900±150 B.C.
UCLA-703B =900±225 B.C.
TF-191 =1115±110 B.C.

These dates come from the middle and late levels of the PGW deposit and give a time range of 1155-660 B.C. Agrawal *et al.* (1978, 1979) say that TF-191 is the only date which exhibits a high antiquity of PGW hence it should not be considered. When we do not consider this date for the antiquity of PGW we see that the earliest is 900 B.C. At 3 sites, namely Jodhpura, Noh and Atranjikhera, nearly 1.50 m. deposit is said to be below the dated levels. Even if 200 years are assigned to this undated level (using Lal's criterion) the antiquity of the PGW in northern Rajasthan and Uttar Pradesh will go back to 1100 B.C.

Thus the stratigraphic and C-14 dates favour a date bracket of 1300-600 B.C. for the PGW culture and its total geographic range.

BRW

The BRW has been found below the PGW at Atranjikhera in the doab and at Noh and Jodhpura in northern Rajasthan. Since no C-14 dates are available for BRW its age has to be estimated on the basis of antiquity of the PGW and the thickness of the BRW deposit at these sites. The beginning of the PGW at the above sites has been dated to 1100 B.C. Considering the gap between the PGW and BRW and a deposit of about 0.30 cm. it may be safer to say that the BRW at Atranjikhera, Noh and Jodhpura is pre-1200 B.C.

The BRW is also found in eastern Uttar Pradesh and Bihar. Four C-14 dates are available for the BRW from Sohgaura in Gorakhpur district, U.P. These are :

PRL-178=1550-1210±110 B.C.
PRL-179=1450-1400±110 B.C.

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PRL-379=1500±95 B.C.

PRL-283=1550-1510±100 B.C.

These dates show that the BRW at Sohgaura belongs to 16th to 14th centuries B.C.

The cultural relationship of the BRW in eastern U.P. and Bihar on the one hand and western U.P. and northern Rajasthan on the other is at the moment far from clear. But if the BRW of the western zone is derived from the eastern zone, 1300 B.C. may not be out of the mark.

Table 4.

TL Dates for OCP

Site	*Sample No.*	*TL Date in B.C.*	*Mean TL Date in B.C.*
Atranjikhera	11164	1610	
	11165	1170	
	C_1	2280	1690
	C_2	1250	
	C_3	2130	
Lal Qila	11291	1730	1880
	11292	2030	
Jhinjhana	11392	1990	
	B_1	1570	2070
	B_2	2650	
Nasirpur	11491	1180	1340
	11492	1180	

Late Harappan and OCP

In the absence of radiocarbon dates from the Late Harappan and OCP levels in the doab and neighbouring areas the chronology of these cultures is suggested on the stratigraphic evidence and extrapolation of radiocarbon dates from other areas.

C-14 dates from Bara give a time range of 2300-1900 B.C. It is notable that the youngest date comes from layer 9 at a depth of about 2.50 m. below the top level of the Harappan occupation, thereby suggesting the habitation at this site must have continued at least 400-500 years later (Sharma 1979). On the basis of C-14 dates and stratigraphic evidence from Gujarat, Rajasthan and

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Panjab, Suraj Bhan (1964), Fairservis (1971 : 306-14) and Possehl (1980 : 13-21) have convincingly shown that the Late Harappan culture came to an end by 1200 B.C. in all its distribution area.

For the OCP 12 TL dates are known from 4 sites (Table 4). Nine of these fall between 1730 and 1180 B.C. and 3 dates go up to 2600 B.C. The agreed TL date bracket for OCP is 1800-1300 B.C. (Lal 1972; Stacul 1973). The antiquity of the PGW and stratigraphic position of the OCP also suggest a terminal date of 1200 B.C. for OCP.

Thus on the basis of the above discussion the following chronological chart emerges :

Late Harappan=1800-1200 B.C.
OCP =1800-1200 B.C.
BRW =1300-1200 B.C.
PGW =1300-600 B.C.
NBPW =700-100 B.C.
Early Historic =200 B.C.-300 A.D.

But if we consider the fact that the appearance of a new ceramic industry marks the beginning of a new cultural period, though the wares of earlier culture may continue, the following chronological periods may be suggested for different cultural periods :

Late Harappan culture : 1800-1300 B.C.
OCP culture : 1800-1300 B.C.
BRW culture : 1300-1200 B.C.
PGW culture : 1300-700 B.C.
NBPW culture : 700-200 B.C.
Early Historic culture : 200 B.C.-300 A.D.

Note

The validity of the radiocarbon dating method depends on the presumption that the amount of C-14 in living plants and animals has always been the same. In Libby's experiments this hypothesis was proved to be correct. But later experiments carried out with improved techniques proved that Libby's hypothesis was incorrect. It has now been established beyond doubt that there has been a considerable change in the concentration of C-14 in the atmosphere and other reservoirs due to the burning of fossil fuel i.e. coal and petroleum (Suess

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1955), atomic explosions (Vries 1958), change in magnetic field (Bucha 1967), change in climate (Damon 1970; Suess 1973) and solar activities (Lingerfelder in Suess 1973 : 37). The cross checking of C-14 dates with dendrodates and varve chronology has also confirmed that there have been fluctuations in C-14 concentration during the past (Suess 1970; Stuiver 1970; Tauber 1970) and C-14 dates were found to be younger than dendrodates. The magnitude of difference was evaluated at the radiocarbon laboratories of Tucson (Damon *et al.* 1966), La Jolla (Suess 1965, Stuiver and Suess 1966) and Pennsylvania (Ralph and Michael 1967, 1969) on the wood samples precisely dated by Ferguson (1968, 1969) by the tree-ring method. It was found that for A.D and first millennium B.C. period the difference between C-14 and tree-ring dates is normally less than 200 years. However, beyond first millennium B.C., C-14 dates become progressively younger than tree ring dates and at 5000 B.C. are 750 years short i.e. C-14 dates are approximately 15% younger. To rectify these differences calibration of C-14 dates was suggested (Suess 1967, 1970; Ralph 1971; Ralph *et al.* 1973; Clark 1975). Ralph *et al.* (1973) and Clark (1975) presented large extended tables for the calibration of C-14 dates.

Since the main basis for calibration was the tree-ring dates obtained on long-lived *pinus* and *sequoia* trees from United States, it was pointed out that local factors may be at play (Collis 1971) and the calibration may not hold good universally (Mackie 1971). But research carried out on wood samples from different parts of the world (Kigoshi and Kobayasni 1966, Kigoshi and Hasegawa 1966, Lerman *et al.* 1969, Suess and Strahm 1970) show that regional aberrations do not exist. The results obtained from the analysis of these samples are in good agreement with the American results. Only the Kauri pine results from New Zealand (Shawcross 1969) do not agree with the American results. But it has been pointed out that the Kauri pine may have been affected by volcanic activity, in the past, which affected C-14 concentration in the atmosphere in New Zealand. Further, recently, it has been noticed that this species has a strong tendency towards growing double annual rings. The regional variation in C-14 concentration is not true and "if it is true, the method of radiocarbon dating would prove to be useless" (Neustupny 1970 : 38).

Agrawal and Kusumgar (1974 : 70-73) are not in favour of any calibration because this "makes the bracket too old to be justified on the basis of historical chronology", and the calibration will "create more confusion than clarity". They put much emphasis on Collis' (1971) view that local factors may have been at play. However, it has been noticed that uncalibrated C-14 dates for samples from the tombs of Egyptian kings Djoser, Sesostris I and Sesostris II are younger than the known historical dates of the samples by as much as 500 years whereas tree-ring dates are in close agreement (Berger 1970; Edward 1970). It has also been noticed that calibrated dates from the Indus sites correspond well with the Akkadian period of Mesopotamia and 2nd dynasty of Ur, the period when the Indus civilization had well-established trade relation with them. Besides, only

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calibrated dates are in agreement with archaeological parallels that link phases such as Mundigak IV, Bampur IV, Namazga IV and Susa D (Dales 1973 : 165). These results clearly show that C-14 dates need to be calibrated.

Table 5.

Source, mechanism and effect of environmental contamination from the radiocarbon dates point of view

(*After Palach 1976*)

Contamination mechanism		*Causes*	*Probable effect*
Solution from Above		Rain	Age Too Young
Solution from Below		Water Table Movement	Age Too Old
Intrusion By or Deposition of		Rootlets,	Age Too Young
		Younger Sediments	Age Too Young
		Older Sediments	Age Too Old
		Graphite and Coal	Age Much Too Old
Recrystallisation of CO_3		Humidity	None
Close system		Temperature	
Recrystallisation	Atmosphere	Humidity	Age Too Young
open-system	Ground Water	Temperature	Age Too Young or Too Old
Ionic Exchange and Substitution	CO_2 Sol	Solution and Redeposition	Age Too Young or Too Old
	HCO_3		
	CO_3		
Bacterial Activity	Aerobic	Aeration, Alternate Wetting and Drying	Age Too Young
	Anaerobic	Closed System (?)	None (?)
Saprophytic Moulds Growing on Samples		Humidity Temperature	None

Table 6.

Effect of varying degrees of contamination by modern carbon on the true sample age

(*After Polach and Golson 1966*)

True sample age	*Approximate age after contamination by modern carbon*			
	1%	*5%*	*20%*	*50%*
5,000 years	4,950 years	4,650 years	3,700 years	2,100 years
10,000 ,,	9,800 ,,	9,000 ,,	6,800 ,,	3,600 ,,
20,000 ,,	19,100 ,,	16,000 ,,	10,000 ,,	5,000 ,,
30,000 ,,	27,000 ,,	21,000 ,,	12,000 ,,	5,400 ,,
100,000 ,,	37,000 ,,			

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Table 7.

Effect on the true sample age of contamination by old carbon i.e. carbon so old that all radio-activity has decayed

(*After Polach and Golson 1966*)

True sample age	*Apparent age after contamination by old carbon*			
	5%	*10%*	*20%*	*50%*
500 years	900 years	1,300 years	2,200 years	6,000 years
5,000 ,,	5,400 ,,	5,800 ,,	6,700 ,,	10,500 ,,
10,000 ,,	10,400 ,,	10,800 ,,	11,700 ,,	15,500 ,,
20,000 ,,	20,400 ,,	20,800 ,,	21,700 ,,	25,500 ,,

While dealing with C-14 dates it is also necessary to keep in mind certain other problems connected with C-14 dates. The chances of contamination do always exist when the sample is buried, collected, stored or any time between immediately after its death and just before the counting of the date. The position of the sample i.e. from the central part ot the mound or periphery, the type of soil cover, rootlets going deep into the mound pits, rain-gullies and organic sullage are the main source of contamination due to which samples give erratic ages (Table 5). Besides, there are several other inherent problems involved with the samples. For example, the wood used for dating may have been biologically dead for several decades, or even centuries when burnt, and as a consequence gives apparently a much older age than the actual age of the oven it was found in. If the sample provided for C-14 dating comes from the centre of the wood, i. e. pith, the date will represent the time when tree started growing and not the time of its use. In the case of old trees like Bristlecone-pine the error may amount to more than 4000 years.

Henry Polach (1976 : 282-84) has divided the nature of contaminants into two categories and has given their effect on the sample's age (Tables 6, and 7).

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PART TWO

(IV) CONTEMPORARY SETTING OF KANPUR DISTRICT

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4

Contemporary Setting of Kanpur District

"Where civilization is indigenous, having developed out of the precivilized people of that very culture, converting them into the peasant half of the same culture—civilization . . . (the) . . . continuity with their own native civilization has persisted. Chinese and Indian peasants remain connected with their own native civilizations."

—Robert Redfield
(1962 : 51-52).

A comprehensive knowledge of the present day human setting can be made to bear upon the understanding of the past. Keeping this in mind, in the present chapter I have tried to project Kanpur district in the second half of the 19th century and first quarter of the 20th century. This period has been chosen for two reasons. Firstly, data available for the period is reasonably sufficient. Secondly, for understanding the past the data for a later period would not be as reliable as of the period stated above. This is because of the drastic changes in the environmental setting that have been taking place during last five decades.

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The main body of data for this chapter comes from the decennial *Census Reports of United Provinces of Agra and Oudh* from 1881 to 1931; *Final Report on the Settlement of Kanpur district* (Wright 1878) and *Kanpur District Gazetteer* (Nevill 1908).

Kanpur district occupies the northwestern corner of Allahabad division. It is bounded by the Ganga on the east and the Yamuna on the west. In shape it is irregular quadrilateral, the angles being situated north, east and south, west. The extremeties are marked by the parallels of 25°26′ and 26°28′ N latitude and 79°31′ and 80°34′ E longitude. To the northeast beyond the Ganga lie the districts of Hardoi and Unnao while to the south across the Yamuna are Hamirpur and Jalaun. In the southeast the boundary marches with Fatehpur district and to the west and northwest are Etawah and Farrukhabad districts, respectively. The total area of the district is 6,167 sq. km.

Topography

In its topography the district resembles the rest of the doab which slopes generally from the northwest to southeast, the gradient following the line of the main rivers. The interior surface is slightly undulating due to numerous minor watersheds that separate the subsidiary drainage lines. The sectional contour is practically the same throughout the district. The level rises sharply from the Ganga bed to the crest of the high cliff and then slopes gently towards the centre, beyond which it again ascends to the ridge overlooking the valley of the Yamuna. The same thing occurs on a miniature scale in the case of smaller rivers, though where the stream has a small volume and velocity the change is hardly noticeable.

The slope of the country is well illustrated by the recorded heights along the course of the Kanpur branch of the Ganga canal which closely follows the line of the main water parting in the district. The level drops gradually from 135.50 m. where the canal first enters the district in extreme north to 129.0 m. at Karsauli in tahsil Kanpur and 126.0 m. near the Kanpur-Fatehpur border.

The centre of the district is slightly lower than the banks of the Ganga and the Yamuna.

Rivers

Besides the Ganga and the Yamuna, there are 6 tributaries which flow through the district. All the rivers follow a course from the northwest to southeast or southwest direction.

Ganga

The Ganga flows along the northeastern boundary of the district for its entire length. It has a wide sandy bed in which the stream rolls from side to side

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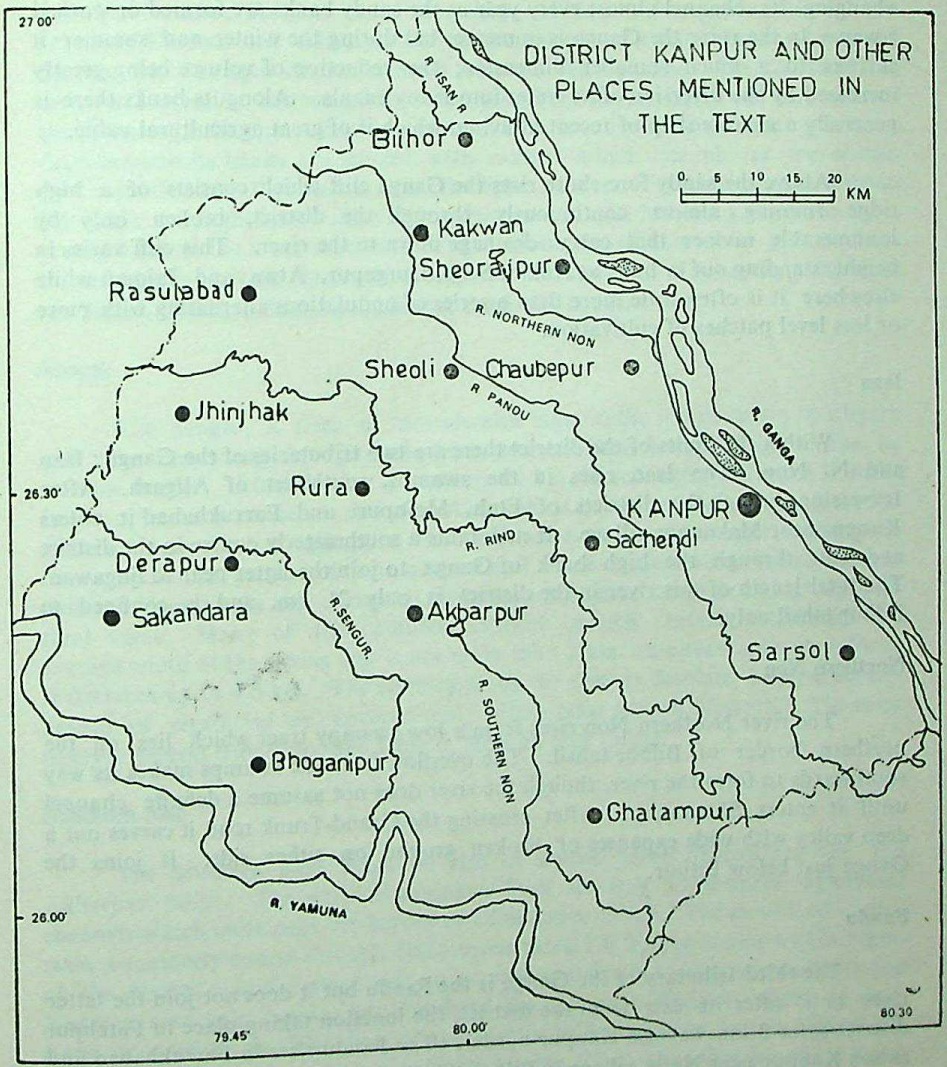

FIG. : 17.

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changing its channel almost every year as the sandy banks are formed or washed away. In the rains the Ganga is immense, but during the winter and summer it shrinks to a much samaller dimension; the reduction of volume being greatly increased by the diversion of its water into many canals. Along its banks there is generally a narrow strip of recent alluvium which is of great agricultural value.

Above the sandy fore-shore rises the Ganga cliff which consists of a high ridge running almost continuously through the district, broken only by innumerable ravines that carry drainage down to the river. This cliff varies in height, standing out in buffs at Ankin, Seng, Durgapur, Atwa and Jajmau while elsewhere it is often little more than a series of undulations alternating with more or less level patches of cultivation.

Isan

Within the limits of the district there are two tributaries of the Ganga : Isan and N. Non. The Isan rises in the swamps, southwest of Aligarh. After traversing through the districts of Etah, Mainpuri and Farrukhabad it enters Kanpur near Makanpur village. It maintains a southeasterly course in the district and cuts through the high bank of Ganga to join the latter near Majhgawan. The total length of this river in the district is only 21 km. and is confined to Bilhor tahsil only.

Northern Non

The river Northern Non rises from a low swampy tract which lies on the northern border of Bilhor tahsil. The overflow from the swamps makes its way southwards to form the river, though the river does not assume a definite channel until it enters Sheorajpur. After crossing the Grand-Trunk road it carves out a deep valley with wide expanses of broken ground on either side. It joins the Ganga just below Bithur.

Pandu

The third tributary of the Ganga is the Pandu but it does not join the latter river until after its exit from the district, the junction taking place in Fatehpur district some 3 km. beyond Kanpur border. The Pandu rises in Farrukhabad and enters Kanpur near Naila village in Bilhor tahsil. Throughout Kanpur it maintains a course parallel to that of the Ganga. In Kanpur the Pandu receives a considerable amount of drainage fed by several nullahs like Nai, Lakua, Paghaiya and Bhori.

Rind

Like the Isan, the Rind also has its origin in Aligarh and before entering Kanpur it traverses through Etah, Mainpuri, Farrukhabad and Etawah districts

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and first touches Kanpur near the village of Nar. After passing through the tahsils of Derapur and Akbarpur it makes its way through the southwest of Narwal into Fatehpur district where it falls into the Yamuna. The course of this river is extremely tortuous. Its total length in the district is 168 km. whereas the distance in the direct line from entry to exit is only 90 km. The river has a deep bed and its banks are scarred with ravines which increase as the stream proceeds through the district. In the upper reaches of this river in the district, the banks are clothed with *dhak* (*Butea frondosa*) jungle; but this gives place to a scanty scrub in the lower reaches. Several tributaries of this river join it from the left side indicating the southern slope of the country. The main tributaries are Siyari, Chhoha, Chalariya, Nariya, Supa and Matru.

Sengur

The Sengur, a river of considerable magnitude, has its origin in Aligarh and after traversing through Etah, Mainpuri and Etawah enters Kanpur from its western border. After flowing for nearly 20 km. in an easterly direction it turns in a southeasterly direction and after Akbarpur it bends southwards and joins the Yamuna near Keotra village, a short distance above Musanagar. Along the river are found patches of fresh alluvial soil where it approaches the confluence with the Yamuna the belt of deposit stretches into a wide *kachchar* of high agricultural value. Many of the countless ravines stretch inland. Although the average width of the ravine belt is not more than 2 km. on either side, sometimes it stretches up to 4-5 km. The country along the river is desolate, being generally devoid of vegetation or covered only with a poor growth of scrub. The river receives several tributaries like Dharia, Retwah and Lilijhi.

Southern Non

The southern Non takes its rise in several large depressions in the Akbarpur tahsil. The surplus drainage finds its way southwards by several channels which unite near the border of Ghatampur tahsil. The combined stream takes a southerly course through Ghatampur tahsil till it approaches within 5 km. of the Yamuna and then bends in a southeast direction almost parallel to the Yamuna, eventually passing into Fatehpur district near Baripal, about 16 km. from its confluence. The bed of the river is at first shallow and ill-defined, its banks being cultivated up to the water's edge. But after Ghatampur it has a well-defined course.

Yamuna

The Yamuna first touches the district in the extreme west of Pukharayan tahsil and maintains a southeasterly course varied by many loops and bends at several places. The bed of the river is at a great depth below the level of the country. At places there are big stretches of fertile alluvial soils between the

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river and the high bank (Pl. II.B). The bank itself rises to a height of 18 m. or more above the stream and is broken by ravines which extend inland for 6 to 8 km. (Pl.I.B). The country on the crest of the bank is of most unpromising description and the soil is either sandy or gravelly, intercepted with the types ordinarily found in Bundelkhand. All the country along the Yamuna is barren and rugged, is infested by wild animals and is notorious as the haunt of dacoits and robbers.

Soil Tracts

The rivers flowing through the district have divided the whole area into five tracts. They are :

1. Ganga-Isan tract
2. Ganga-Pandu tract
3. Pandu-Rind tract
4. Rind-Sengur tract
5. Sengur-Yamuna tract

Ganga-Isan Tract

This tract is a narrow strip of land between the Ganga and Isan on the northeast side of Bilhor town. It is a fairly level tract with a light fertile loam soil.

Ganga-Pandu Tract

This tract consists of a long and narrow strip or land between the Isan and the Ganga on the east and Pandu on the west. It extends to the whole length of the district. This tract is lowlying and is intercepted by several depressions one of which forms the source of N. Non. The soil is generally loam or clayey loam towards the north of the depressions. South of these depressions lies a stretch of firm loam which is softer and sandier in character, with a slightly pink tint in the Kanpur tahsil. In the Narwal area it again reverts to the upland loam of the north, although there is considerable lack of homogeneity due to the appearance of scattered blocks of sand, *usar* and swamp. The transition from the hard and gritty soil of the Ganga cliff to the undulating banks of the Pandu is gradual.

Pandu-Rind Tract

In the west of the Ganga-Pandu tract, stretching throughout the north-south direction lies the Pandu-Rind tract. In the northern portion of this tract

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the soil is more or less similar to that found on either side of the Pandu as this river has a shallow channel and produces little effect on the neighbouring land. The dominant features of this part of the tract are large stretches of *usar* and several lakes. This tract covers almost the entire remaining parts of the Bilhor tahsil but narrows southwards until it disappears completely near Sheorajpur. The rest of this tract comprises of red sandy loam.

Rind-Sengur Tract

South of the Rind lies a broader strip of the country extending as far as Sengur in the west and further down reaching up to the bank of the Yamuna. The western portion of this, comprising the bulk of the Derapur tahsil and about half of the Akbarpur tahsil, is a level tract of loam, which is lighter than in the country to the east and less marred by *usar*. The *usar* of this area is less malignant in character and at places it is covered with *dhak* jungle. In Derapur, due to the lack of natural drainage, swamps are common. Towards the Sengur the soil is pink and it extends up to the very edge of the ravines. In the central and northern parts of the Akbarpur tahsil the level drops and stiff, ill-drained and swampy soil, subject to water logging and full of *usar* appears. This extends up to the north of Ghatampur and covers parts of Pukharayan to the east of Sengur. Further south a belt of light loam with an occasional sandy ridge is found.

Sengur-Yamuna Tract

The tract lying between the Sengur and the Yamuna forms a part of the level upland with a lighter soil merging into the ravines of the two rivers on either side. Depressions are rarely found. The soil is generally sandy in texture.

Soils

On the basis of physical and chemical characteristics, the soils of Kanpur district have been divided into six categories (Table 8, Fig. 18). Each of these categories includes several soils of a similar nature with only minor variations which do not significantly influence their agricultural use (Agrawal and Malhotra 1952).

Kanpur Type I (Recent Alluvium)

These soils are formed from the recent alluvium of the Ganga and are found on a narrow strip of land near the river. They are characterised by their mild calcareous nature, with or without *kankar* nodules and a pronounced sandy texture throughout the profile. The soils are grey to brownish-grey in colour on the surface. The lower layers are slightly darker. The clay content is generally low and whatever clay is present it is rich in exchangeable calcium. The soils are slightly alkaline in reaction. The ground-water level in the area being very high,

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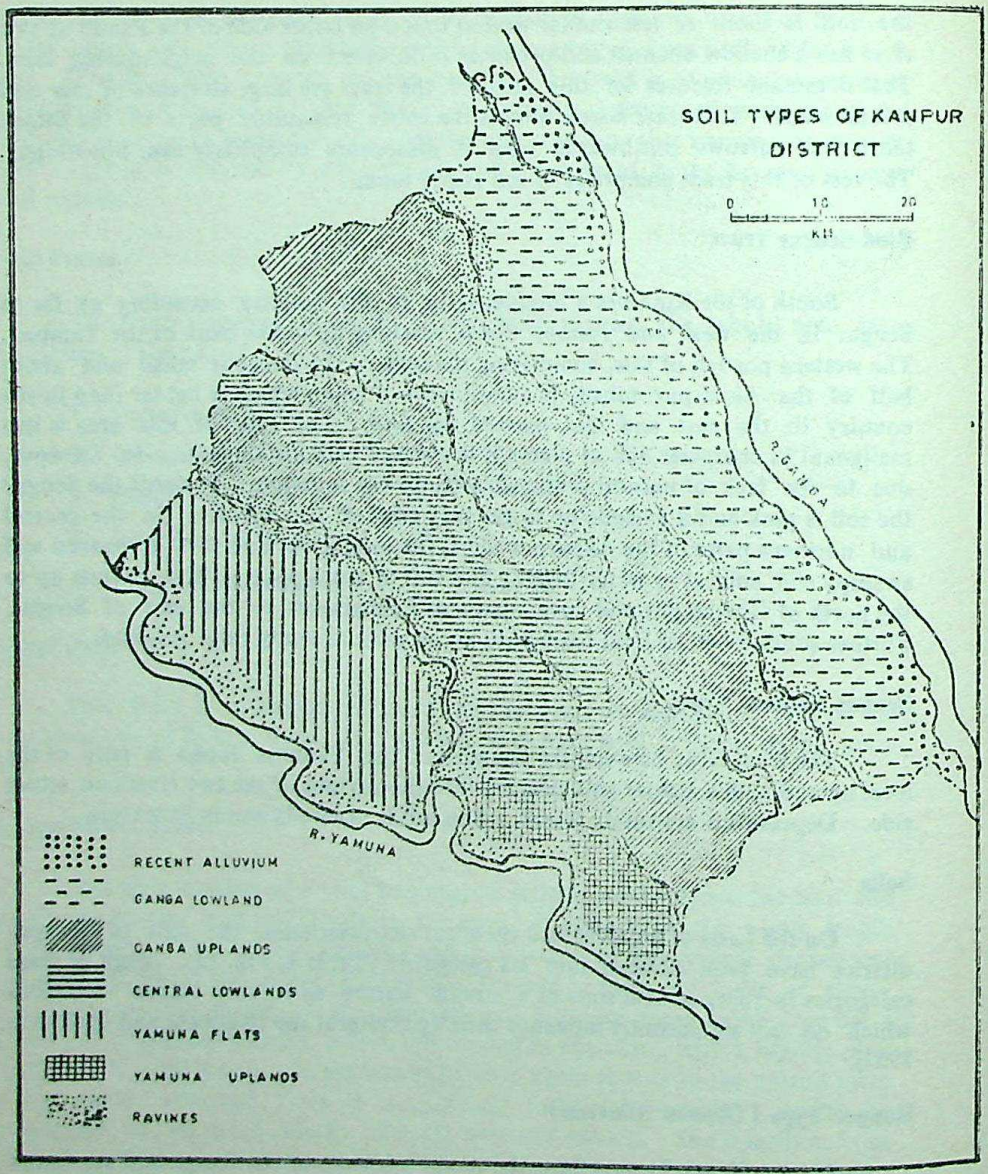

FIG. : 18.

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a considerable degree of salt efflorescence is observed, especially in the areas near the Ganga. At some distance from the river, soils are free from this surface-salt affect, though even in them the soluble salt content may be high.

Kanpur Type II (Ganga Lowlands)

These types of soils occur at slightly elevated land and are away from the fluvial action of the Ganga. The soil surface is grey to dark grey in colour while the lower layers show a yellowish tinge. The texture of the surface soil is finer than that of type I and varies from loam to clay loam. The soils have little free calcium at the surface but the lower layers are rich in it. The soluble salt content is high and the salt occasionally effloresces at the surface during summer. The exchange capacity is high. The p^H value of soils is neutral at the surface but alkaline at lower depths.

In depressional pockets, in the otherwise flat landscape occupied by this soil type, a considerable degree of salinity is met with. About one-third of the *usar* land of the district is found in this tract. The characteristic features of *usar* land on this type of soil are : wide-spread salt incrustation, barrenness, poor drainage and an inadequate clay pan in the sub-soil region (Pl.I.A.).

Kanpur Type III (Ganga Uplands)

The soils included in this type occur at the highest elevation of the district and have been formed from the oldest alluvium. These are usually found away from the right bank of the Pandu. They are characterised by a reddish brown colour at the surface which darkens with depth. The soils are heavier and show the evidence of clay accumulation which has moved down from surface. The soils are completely devoid of calcium. Organic matter and calcium are low and, thus, they are slightly acidic in reaction.

The region having this soil has an excellent to excessive drainage and is completely free from injurious soluble salts.

Kanpur Type IV (Central Lowlands)

This soil type covers the areas of the southern portion of Akbarpur, north-western portion of Ghatampur and the central portion of Darapur tahsils. The tract is dotted with a large number of lakes.

These soils have been formed due to the influence of topography and relief whereby they are washed by the surrounding areas. They are fine in texture. The colour of soils varies from ashy grey to grey throughout. They are rich in lime and generally have a layer of calcareous nodular deposit which sometimes may be transformed into massive rocky blocks. Because of very poor drainage there is

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Table 8.

Broad Differential Characters of Kanpur Soils

(After Agrawal and Malhotra 1952)

Particulars	*Ganga*	*Alluvium*		*Yamuna*	*Alluvium*	
	Recent Alluvium	*Ganga Lowlands*	*Ganga Uplands*	*Central Lowlands*	*Yamuna Flats*	*Yamuna Uplands*
Colour	Grey	Dark grey	Brown reddish	Ashy grey to dark grey	Dark grey to grey brown	Dark grey to grey brown
Texture	Sandy to silty loam	Loam to clay loam	Sandy loam	Clay loam to loam	Sandy loam to loam	Loam to clay loam
pH	7-8	7-8 and above	6.2-7.4	7.2-8.8	6.6-8.8	7-8
Lime	3-4% throughout	Less than 1% more at bottom	Less than 1% throughout	Average to high	Average to high	Average to high
Clay	Poor	Average to high	High in sub-soil	Very high	Moderate	Average to high
Soluble salts	High	Average to high	Poor	Highest in district	Average	Poor
Drainage	Imperfect	Fair	Good	Very poor	Fair	Average
Average base solution	86	81	70	64 in cultivated soils and 28 in uncultivated soils	84	78
Concretion	Ill-defined	Prominent	Absent	*Kankar* present	*Kankar* present in sub-soil	Absent

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no outlet for the huge volume of rain water and due to the presence of a thick *kankar* bed it cannot penetrate the sub-soil. This process of water logging gives rise to salts both from the soils and from the ground water which on evaporation impregnates the surface soil with salts in large quantities. These salts being mainly carbonates of sodium are responsible for high p^H value (7-11) and for bringing considerable degree of alkalization. A significant portion of this soil type area has, therefore, been rendered unfit for cultivation. Such alkaline land is known as *usar*. The worst type of *usar* of the district is found on this tract and only high-lying, well-drained village sites are free from alkali and used for normal cultivation.

Kanpur V (Yamuna Uplands)

This soil type is found in a small tract of land about 6 km. in width adjoining the Yamuna ravines towards the southern portion of the Ghatampur tahsil. The soils are mainly of a light friable loamy texture and are from grey to dark grey in colour. Signs of alluviation are not very clearly marked. The lime content is average and injurious soluble salts are low. The base exchange capacity is high and the exchange complex is adequately rich in divalents.

Kanpur Type VI Yamuna Flats)

This soil occurs in the western portion of the district, mainly in the tracts lying between the Yamuna and Sengur. These two rivers form one of the most extensive and rugged ravines of this country (Pl.I.B.). The ravines of the Yamuna are immense in size, at times rising to a height of 22 m. or even more above the river bed. Ravines along the Sengur are extensive but do not reach the height of the Yamuna ravines. Above the ravines occurs the level plateau consisting of sandy loam soil which is grey to brown in colour. The sub-soils have not indurated, too much, though they show some tendency in that direction. They exhibit little alluviation and are frequently calcareous, though the lime content is not as high as that found in soil type IV or in the recent Ganga alluvium. Smaller or even medium sized *kankar* nodules are found interspersed in the sub-soils of this type. Soluble salts, consisting mainly of bicarbonates and very little of carbonates are in average quantities in the soil profile.

Barren and Usar Lands

From the description of the soils of the district it becomes apparent that a large area has either been rendered uncultivable or is liable to deteriorate due to rapid salinization, particularly in ill-drained and low-lying soil regions. An idea of the extent of barren land including *usar* areas in different tahsils of the district together with the total cultivated area can be obtained from Table 9.

It would be seen from the figures given in the table that the largest portion of barren land including *usar* occurs in Akbarpur tahsil followed by Bilhor and

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Kanpur tahsils. A major portion of barren tracts found in Bilhor tahsil is of a different nature from that found in Akbarpur tahsil, since the former contains a large area of undulating and eroded tracts lying parallel to the bank of the Ganga. Due to the nearness of ground water and the coarse sandy nature of the soil, salt efflorescence occurs in large proportions during the dry period. The *usar* found in Derapur and Akbarpur is formed due to water logging. The tahsils of Pukharayan and Ghatampur have a comparatively low percentage of barren land and a major portion of whatever little is present is traceable to the presence of the large devastating ravines of the Yamuna and Sengur in Pukharayan tahsil and of Sengur and Rind in Ghatampur tahsil.

Table 9.

Distribution of Land Acreage (in hect.) in Kanpur District

(After Agrawal and Malhotra 1952, Vol. II, Table XXVIII)

Tahsil	*Soil type*	*Total area*	*Usar and Banjar*	*Culturable*	*Cultivated*	*Percentage of barren land*
Akbarpur	II & IV	95,567	26,588	11,715	57,264	27.82
Kanpur	I, II & III	104,445	28,192	18,003	58,250	26.99
Ghatampur	III & VI	110,409	18,387	12,508	79,514	16.65
Bilhor	III	100,815	27,185	16,831	56,799	26.97
Pukharayana	IV	98,478	15,864	15,333	67,280	16.11
Derapur	III & VI	104,609	24,534	13,876	66,200	23.45

Lakes

The district contains a large number of small depressions in which rain water accumulates and forms shallow lakes. These are found in the south of Bilhor, the central portion of Derapur, the eastern part of Narwal, and the northern part of Ghatampur tahsils. The most important ones are at Jahangirabad (Pl II.A.) in Ghatampur, Harnu, Itali and Naila in Bilhor, Rasulpur and Gogamau in Akbarpur, Macharia in Kanpur and Rahnas in Narwal. The total area under water averages 44,100 acres or 2.2 per cent of the area of the district. This includes rivers also, which comprise a bulk of the whole amount. The highest proportions are 3.62% and 3.41% in Ghatampur and Sheorajpur respectively, followed by 3% in Bilhor.

Forests

The district presents a well-wooded appearance. Patches of *dhak* (*Butea frondosa*) are to be seen all over the district. The largest stretches are to be found

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near Harnu, in Bilhor tahsil and near Rura in Akbarpur tahsil. In the lower reaches of the Rind and Pandu and in several other parts of the district *babool* (*Acacia leucophoria*) is found in abundance. The ravines of the Yamuna and Sengur bear little except the worthless scrubs of *Alhagi maurarum, caparis aphylla, Tecoma undulata* and *Salsola kali.* In all there is 97,000 acres of bush and tree jungle in Derapur and Akbarpur. About 6,300 acres of grassy wasteland is found in the district. The scattered trees account for 30,000 acres; Darapur and Narwal constitute one-third of the total.

Fauna

The wild animals of the district are similar to those found in the adjoining tracts of the doab. Two to three centuries back, lions (*Panthera leo*) and tigers (*Panthera tigris*) were found in the district. The leopard (*Panthera parolus*) is still found in a small number in the ravines of the Yamuna, especially near the confluence of the Sengur. Wolves (*Canis lupus*), hyenas (*hyaena hyaena*), foxes (*Vulpes bergalen*) and jackals (*canis aureus*) are quite common throughout the district. Wild boars (*Sus scropa*) and chinkaras (*Gazella gazella*) are found in the ravines of the Yamuna and the grassy *khadar* of the Ganga. Nilgai (*Boseaphus gecamdus*) and blackbuck (*Antelop cervicapra*) occur throughout the district.

Climate

The climate of the district is the same as that of the doab from Agra to Allahabad. From March to June it is characterised by extreme heat (temperature 40-48°C) and dryness, intensified by a strong westerly wind, (speed 10-14 km. per hour), occasionally accompanied by violent dust storms (Table 10). With the approach of the monsoon the temperature starts coming down but the weather by and large remains oppressive. The temperature during the rainy season ranges between 25°C and 34°C. The cold weather starts by the end of October and the temperature falls gradually until it reaches its minimum in January (6-10°C). Frosts are common but they are seldom of much intensity.

Rainfall

The average annual rainfall in the district is nearly 80 cm. (Table 11). The variations from tahsil to tahsil is slight but quite significant. The tahsils in the west namely Derapur and Pukharayan receive an average 6-10 cm. less precipitation than the tahsils in the east, namely Bilhor and Kanpur. This indicates that the influence of the Ganga on the precipitation is greater than that of the Yamuna. While the average difference for 50 years is low, the variations that occur from year to year are very striking. Treating an excess or deficit of more than 25 per-cent as abnormal there have been nine occasions during 44 years (from 1864-1905) on which the rainfall has been exceptionally heavy and nine on which deficiency was equally marked. In other words, in each period of five years one may expect

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Table 10.

Monthly and Annual Mean of Temperature in °C (1881-1940) in Kanpur District

Month	Mean of				Highest recorded in the year	Lowest recorded in in the year
	Daily Maximum	Daily Minimum	Highest in the month	Lowest in the month		
January	22.2	7.1	27.7	4.2	31.1 21.1931	2.2 25.1905
February	25.0	10.6	31.3	6.2	35.6 28.1930	0.6 2.1905
March	31.9	15.6	38.7	10.9	42.8 28.1931	7.2 2.1906
April	37.4	21.3	42.3	17.2	45.6 30.1938	11.1 3.1905
May	41.2	26.9	45.0	21.2	47.2 20.1897	17.8 3.1909
June	39.3	28.3	44.5	23.3	47.2 11.1931	20.6 3.1922
July	33.6	26.6	39.7	24.1	45.0 10.1903	22.2 10.1936
August	32.06	26.0	36.2	22.7	40.6 1.1903	21.7 25.1934
September	32.7	24.4	36.2	22.0	40.0 2.1932	16.1 27.1896
October	32.9	18.9	38.9	14.7	40.6 3.1896	11.1 30.1895
November	28.2	11.7	32.6	8.8	36.1 4.1940	6.1 26.1910
December	23.3	8.1	27.8	5.1	31.1 6.1940	1.7 27.1902
Annual Mean	31.7	18.8	36.5	15.1	47.22	0.6

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Table 11.

Monthly and Annual Rainfall in Kanpur District

(Average of 47 years (1893-1940) in cm.)

Month	*Tahsils*					
	Kanpur	*Bilhor*	*Derapur*	*Akbarpur*	*Pukharayan*	*Ghatampur*
January	1.55	1.63	1.40	1.45	1.29	1.54
February	1.16	1.01	1.09	1.11	1.11	1.07
March	0.61	0.79	0.56	0.50	0.69	0.71
April	0.46	0.46	0.56	0.71	0.56	0.25
May	0.10	0.97	0.86	0.99	0.69	0.64
June	8.05	9.30	9.25	8.33	8.43	10.16
July	25.43	26.85	22.60	25.88	25.25	25.88
August	26.49	26.34	25.22	25.40	24.74	26.52
September	13.21	14.86	12.45	12.04	12.12	13.84
October	3.10	2.72	3.07	2.87	2.24	3.58
November	0.31	0.41	0.22	0.19	0.25	0.22
December	0.74	0.91	0.69	0.69	0.76	0.91
Annual	81.24	86.25	77.97	80.16	78.13	85.32

both a famine and a flood. The floods are often extensive but the damage is generally limited to the *kachchar* land along the course of the Ganga. These floods, which mainly occur in September are not necessarily the result of heavy rains in Kanpur district. The maximum recorded rise (4.5 m. above the danger mark) took place in 1874, when the rainfall in this district and in its neighbourhood also, was normal. A similar instance was that of August 1980 when the flood was very extensive, though the total rainfall in the district was only about 100 cm.

The wettest year recorded was 1894 when the precipitation over the entire Ganga-Yamuna doab was exceptionally heavy and Kanpur received 147.5 cm., 1867 with 129.5 cm., and 1904 with 118 cm., though the last record was mainly due to a precipitation of 164 cm. at Bilhor. Other wet years were 1870 with 110 cm., 1884 with 106.5 cm., 1891 with 105 cm., 1893 with 108.5 cm., and 1898 with 107 cm. In 1891 the rainfall was not at all exceptional in most parts of the district and along the Yamuna it was actually below average, but the astonishing amount of 193 cm. was recorded at Bilhor where 33.25 cm. was recorded in the course of twenty-four hours. On the other hand, the year of greatest deficit was 1880 when the district's average was only 28 cm. Narwal received only 15.75 cm. for the

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whole year. This caused a total failure for the *kharif* crops and marked the contraction in the *rabi* crops' area and the consequence was famine. The result of a general average of 33.75 cm. was even more serious in 1905 as the *rabi* crops were badly hit and caused famine in the Yamuna tract. Next came 1877 with 34.50 cm. and on this occasion the southern and western tahsils i.e. Narwal, Ghatampur, Pukharayan and Derapur fared the worst. Other years of a deficit rainfall were 1864 with 47.60 cm., 1867 with 40.0 cm., 1883 with 58.0 cm., 1886 with 44.5 cm., 1887 with 71.5 cm., 1902 with 56.5 cm. and 1907 with 43.80 cm.

Village

The village corresponds a *mauza* (a revenue unit) and consists of a centrally inhabited site with a tract of cultivated land around it. It is usually in the form of scattered hamlets. These consist of homestead of a landlord or a wealthy tenant around which cluster the houses of his farm servants. Unless there are other circumstances, one may expect that the better the land available for agriculture, the greater the possibilities of the existence of hamlets, as the tenants prefer to live near their holdings. This saves time, permits a more care free and intensive cultivation and facilitates protection of crops. Even in these hamlets, houses are closely packed together as in the main site. Sometimes we see several detached hamlets in one revenue *mauza*. This indicates that though the total population of a revenue *mauza* may be large, it lives in numerous small hamlets dotted over the area. This type of villages are quite common in the Yamuna tract.

Table 12.

Number of Villages in Different Categories in Kanpur District

(Based on *Census of India* 1971, Series 21, Part II-A)

Tahsil	*Small Village Below 500*	*Big Village 500-1999*	*Regional Centre 2000-4999*
Bilhor	240	159	15
Kanpur	119	117	16
Akbarpur	128	146	14
Derapur	135	181	13
Bhogaripur	134	164	10
Ghatampur	125	157	18

The area included in a *mauza* is frequently very extensive and the population required to cultivate it is consequently large. In such cases if the central site is adhered to, and hamlets are not formed, the village will grow so populous that in most cases it would be considered a town. Bithur, Sheorajpur, Sanchendi, Narwal

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etc. are such examples of towns. Their inhabitants follow no urban occupation themselves, but these large villages become convenient centres for itinerant murchants and rural artisans.

In an agriculturally prosperous area villages are compact and if the dwelling is, or becomes scattered, it shows that the agricultural prosperity has declined. To this it can be added, that in agriculturally less prosperous areas, compact villages hardly grow. Thus the growth of the village size is a fair index of agricultural prosperity.

Spacing of Villages[1]

In the district the total number of settlements which are classified in various categories and distributed in all the six tahsils are 1,898 (Table 12). The spacing pattern of settlements shows that the spacing of small villages (1.78 km.), big villages (2.45 km.) and regional centres (6.73 km.) is minimum in Kanpur tahsil which is in the Ganga-Rind doab and the maximum spacing between the two small villages (2.32 km.) and big villages is in the Ghatampur tahsil and of regional centre (10.67 km.) in Pukharayan tahsil. Both these are in the Yamuna-Rind doab. When we compare the average spacing patterns between the tahsils along the Yamuna i.e. the ones located in the Yamuna-Rind doab and the tahsils located along the Ganga i.e. in the Ganga-Rind doab (by taking Akbarpur tahsil common for both the regions) we find that in the Ganga-Rind doab the average spacing of the small villages is 1.80 km., big villages 2.66 km. and regional centres 8.30 km. while in the Yamuna-Rind doab the average spacing between the small villages is 2.20 km., big villages 2.73 km. and regional centres 9.53 km. (Table 13).

Table 13.

(Average Spacing (in km.) of Settlements in Kanpur District

(Based on Table 12)

Tahsil	*Small Village*	*Big Village*	*Regional Centre*
Bilhor	1.80	2.78	9.20
Kanpur	1.78	2.45	6.73
Akbarpur	2.05	2.75	9.00
Derapur	2.03	2.63	9.82
Bhoganipur	2.02	2.67	10.67
Ghatampur	2.32	2.83	8.60

Thus we see that in the Ganga-Rind doab the average spacing between the two settlements is less in comparison to those which are in the Yamuna-Rind doab.

1. For the method to obtain the spacing between two villages from the total number of the villages and the area see Chapter VI.

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Houses and Number of Persons Per House

The houses in the district are generally rectangular in the ground plan. They are built of mud but sometimes of burnt bricks also. In the centre of the house is the courtyard which serves as a working place for women. Three to four rooms are built around this courtyard. The flat roof is built of wooden beams, planks, stalks, bamboos, twigs, dry leaves and matting on which prepared clay is spread. Final touches are given with cow dung to make the surface smooth. Arrangement is made for draining the rain water from the roof by fixing outlets made of tin or baked clay. The upper edge around the roof is sometimes covered with grass or some other matter for protection against heavy showers. The flat roof of brick and lime is rare and only the well-to-do can afford it.

The houses in the villages are very striking for their smallness. The roofs and doors are low and rooms are small. The inside is dark and windows consist of small unglassed openings. When built of more substantial material than mud, there is frequently an upper story reached by steep stairs. The upper story is generally used for storing fodder, drying cotton and for sleeping in summer.

The houses are usually located in large compounds (*ahatas*) in which they are so closely spaced that the lanes between the houses will sometimes admit only persons walking in a single file.

In the census before 1881 the number of rooms per house and the size of house are not mentioned. In the table 14 the average number of persons residing in one house has been given for four districts. The table shows that in the western part of the doab there was some crowding in the beginning, but later on the number of persons per house decreased considerably due to the increase in the density of houses per sq. km. Table 15 shows that for the total doab there was no significant difference in the average number of persons per house in rural and urban areas.

Table 14.

Average Number of Persons Per House

Districts	*Persons per house*						*Average per sq. km.*					
	1881	*1891*	*1901*	*1911*	*1921*	*1931*	*1881*	*1891*	*1901*	*1911*	*1921*	*1931*
Kanpur	5.9	5.1	5.9	4.1	4.0	4.3	84	101	91	117	122	119
Saharanpur	10.6	4.9	4.7	4.3	4.1	4.4	41	91	97	106	107	111
Etah	7.5	6.3	5.0	4.6	4.5	4.6	51	64	99	108	106	108
Bulandshahr	8.2	5 9	5.0	4.6	4.1	4.7	64	90	122	127	121	129

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Table 15.

Average number of Persons Per House in the Ganga–Yamuna Doab

Year	*Total*	*Rural*	*Urban*
1911	4.59	4.64	4.54
1921	4.55	4.57	4.54
1931	4.61	4.82	4.40
1941	5.13	5.01	5.25
1951	4.97	5.07	4.87
1961	5.01	5.17	5.03
Total Average	4.82	4.88	4.77

Population

Although the external boundaries of the district have remained intact since the separation of Fatehpur in 1825, the extensive internal changes that have taken place in the matter of tahsil arrangement, especially in 1860, 1894 and 1911, render it impossible to establish a satisfactory comparison of results obtained at successive enumerations in various tracts. In the census report of 1853 figures are given for no less than 12 tahsils the total of which in 1860 becomes 9, 8 in 1894 and finally 6 in 1911. Consequently existing sub-divisions of Bilhor, Derapur, Pukhrayan and Kanpur no longer represent the same area as at the time of the 1901 census and previous enumerations. It is therefore, necessary to keep in mind that the earlier statistics of these tahsils refer to them as they were prior to the reconstitution of their areas. For the purpose of convenience the figures of 1891 have been adjusted according to the 1894 adjustment, and of 1901 have been adjusted according to 1906 adjustment of areas.

The first authentic census of the district was taken in 1847. The total population then turned out to be 9,93,031 and density per sq. km. was 160 persons. The next census was taken in 1853 and on this occasion the total population was 11,74,556 with an average density of 190 persons per sq. km. The population in all the tahsils along the Ganga was above 200 persons per sq. km. while in those along the Yamuna it was 140 persons per sq. km.

The third census took place in 1865. It was much more systematic than the previous censuses. The enumeration showed a total of 11,92,836 inhabitants, and the average density of 197 persons per sq. km. It was 387 persons per sq. km. in Kanpur tahsil, 216 in Sheorajpur, 203 in Bilhor and 197 in Narwal while in Akbarpur and Rasulabad it was 163 and 165, respectively. Derapur had 146, Ghatampur 142 and Pukharayan 140 persons per sq. km.

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Table 16.

Variation in Population Density Per sq. km. in Different Tahsils of Kanpur District

Tahsil	*Census Year*								
	1881	*1891*	*1901*	*1911*	*1921*	*1931*	*1941*	*1951*	*1961*
Bilhor	212	211	177	162	160	177	190		241
Kanpur	399	448	467	419	421	419	673		1,142
Sheorajpur	213	209	209	184	—	—	—		—
Narwal	182	177	166	168	—	—	—		—
Akbarpur	175	163	172	156	158	155	174		239
Derapur	151	148	190	169	168	159	177		238
Bhoganipur	122	135	150	139	137	146	173		228
Ghatampur	130	135	143	138	140	143	171		233
Rasulabad	176	171	—	—	—	—	—		—

(Tahsils 1-4 (from top) are in the Ganga-Rind doab, 5 is spread both in the Ganga-Rind and the Yamuna-Rind doab and 6-9 are in the Yamuna-Rind doab. Tahsils 3, 4 and 9 were broken in subsequent years and merged in various tahsils.)

The census of 1872 showed a marked decline in the population which is difficult to explain as the preceding seven years had been a period of fair prosperity. Nevill (1908 : 42) thought that there had been considerable migration but a more probable cause lies in the greater accuracy of the enumeration. The population at this time was 11,56,055 giving an average density of 186 persons per sq. m. The average population per sq. km. in Kanpur tahsil was 382, in Bilhor 200, in Sheorajpur 198 and in Narwal 175. The average density per sq. km. had dropped to 158 in Akbarpur and 139 in Ghatampur but in Rasulabad, Derapur and Pukharayan it had risen to 167, 148 and 142 respectively. It will, thus, be observed that while the tahsils along the Ganga showed a general trend of decline, the population had increased in thinly populated areas along the Yamuna. But still, in general, the population density in the tahsils along the Ganga was much more than in the tahsils along the Yamuna.

The next enumeration was done in 1881 which is considered to be the most accurate till that time. The total population in 1881 was 11,81,396 and the resultant density per sq. km. was 190 persons. Kanpur tahsil showed an average of 393, Sheorajpur 210, and Bilhor 209 persons per sq. km. Next came Narwal with 180, Rasulabad with 173, Akbarpur with 172 and Derapur with 149 persons per sq. km. In Ghatampur and Pukharayan the average density per sq. km. was 128 and 120 respectively.

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The following decade was a period of relative prosperity and there was a rapid increase in population. The census of 1891 showed a population of 12,09,695 the average density being 197 per sq. km. But the growth of population was very uneven. The city had grown with a very rapid speed and the average population per sq. km. was 441 persons. The recovery in Ghatampur and Pukharayan was almost complete with the density being 133 in both tahsils. Other tahsils, however, showed an appreciable decline ranging from 3 to 5 per cent. The density per sq. km. was 208 in Bilhor, 260 in Sheorajpur, 174 in Narwal, 168 in Rasulabad, 160 in Akbarpur and 146 in Derapur.

The ten years terminating in 1901 began with a succession of abnormally wet seasons which had a pernicious effect on agriculture and general health. Then followed the famine of 1896-97. With the restoration of normal conditions the recovery was complete and rapid. The total population at the census of 1901 was 12,58,868. The average density per sq. km. was 223 persons. This average was in large measure influenced by urbanisation, for if the population of the Kanpur tahsil is excluded, the density drops to 176 persons per sq. km. Taking the total number of inhabitants, the Kanpur tahsil showed 452 and Sheorajpur 226 persons per sq. km. As at the previous census, the increase was not common to the whole area. It was most noticeable in the thinly populated tahsils along the Yamuna. The density went up from 126 to 148 in Pukharayan and from 170 to 187 in Derapur. In Ghatampur it was 140 and in Akbarpur 169 presons per sq. km. On the other hand, Bilhor showed a decline, the density being 174 as compared to 176 in 1891 and in Narwal the population had fallen off to a marked extent, the average being 163 persons per sq. km., very much less than in 1853.

The decade terminating in 1911 was rather unfavourable for population growth. Due to epidemics and famines caused by failure of rains, population decreased considerably. The gradual increase of population in the last thirty years received a great setback. The total population in 1911, was 11,42,268; 1,16,582 persons less than in the previous census year. The fall was evident in all the tahsils. The decrease was most drastic in the tahsils along the Ganga. In the case of Sheorajpur, Akbarpur and Narwal the density was even less than in the 1881 census. Now the density was 156 in Akbarpur, 184 in Sheorajpur and 156 in Narwal. In Bilhor the density came down to 162 from 177, in Pukharayan to 139 from 150, in Ghatampur to 138 from 143 persons per sq. km. In spite of the growth of the city the average density of the Kanpur tahsil came down to 419 persons per sq. km.

The census of 1931 showed a good recovery. The total population was now 12,12,253—the average density of the district being 201 persons per sq. km. The density in Kanpur was 419, Bilhor 177, Akbarpur 155 and in Ghatampur 143 persons per sq. km. The density in Pukharayan and Derapur was 156 and 159 respectively.

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Because of uneven rainfall resulting in damaged crops and, consequently, famine and due to occasional epidemics the population increase in the 50 years i.e. from 1881 to 1931 was only 2.61 per cent as againat 10.6 per cent for the entire province.

But from 1941 onwards due to modern medical facilities, health care and timely relief at the time of flood, drought, famine etc. the population has been constantly increasing with a rapid speed (Table 16).

The distribution pattern of population in different tahsils of the district shows that the density per sq. km. in the tahsils in the Ganga-Rind doab is greater than in those in the Yamuna-Rind doab. When we estimate the density pattern in the two areas we find that right from 1881 to 1961 the density in the Ganga-Rind doab was more than in the Yamuna-Rind doab. The density per sq. km. ranged from 218 to 541 in the Ganga-Rind doad and from 150 to 235 in the Yamuna-Rind doab (Table 17). This shows that the Ganga-Rind doab is more attractive for the human settlements than the Yamuna-Rind doab.

Table 17.

Average Population Density in the Ganga-Rind and the Yamuna-Rind Doab

Year	*Ganga-Rind Doab*	*Yamuna-Rind Doab*
1881	236	151
1891	242	150
1901	238	163
1911	218	151
1921	246	151
1931	251	152
1941	346	174
1951	—	—
1961	541	235

The distribution pattern of the villages in different categories (Table 18) shows that from 1901 i.e. since the data is available, to 1941 it was fluctuating. But there remained a consistency in the size and number of settlements and the population living in them. Smaller villages were highest in number. They constituted more than 60 per cent of the total number of settlements and the population living in them varied from 28.28 per cent to 35.50 per cent of the total. But after 1941 with the increase in population the size of the villages also increased to the extent that in 1971 census there were only 36.70 per cent villages which have the population less than 500 persons and the total population living

Table 18.

Percentage of villages and Population in Different Size Categories

Year	Less than 500		500–999		1000–1999		2000–4999		5000–9999	
	1	2	1	2	1	2	1	2	1	2
1901	63.80	30.00	23.00	30.20	10.70	26.90	2.40	12.40	0.10	0.50
1911	67.25	28.28	20.99	25.16	9.89	22.44	1.82	8.45	—	—
1921	68.60	35.50	21.50	32.40	8.40	32.90	1.40	7.50	0.10	0.70
1931	67.05	26.92	21.85	24.99	8.13	19.12	2.01	8.40	0.05	0.54
1941	61.41	20.14	25.35	21.97	10.45	17.63	2.72	8.90	0.10	0.67
1951	55.60	24.30	27.40	30.80	13.40	27.60	3.60	17.30	—	—
1961	46.30	18.10	30.90	29.50	17.90	32.90	4.50	16.70	0.40	2.80
1971	36.70	12.20	33.00	25.90	22.00	33.80	7.50	22.90	0.80	5.20

1. Percentage of villages in this class to the total number of villages.
2. Percentage of population in this class to the total population.

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in them constituted only 12.20 per cent of the total (Table 18). This indicates that there has been a steady increase in the size of settlements with the increase in population.

Cultivated Area

Table 19 gives a detail break-up of the land use pattern of the district for the years 1969-70 and 1975-76. But for the cultivated area we have a complete record since 1838. In this we can have a very clear idea of how the cultivated area has fluctuated during different years due to various reasons. The 1838 agricultural survey showed that 2,96,867 hect. was under tillage. This figure was below normal because of disorganisation caused by the famine of the preceding year. The figure for 1845 was 3,16,560 hect. which amounts to about 53 per cent of the total area. The increase in cultivated area continued steadily and it was 3,48,016 hect. in 1873. A more systematic annual record for thirty years from 1876-77 onwards shows that for the first decade the average area under cultivation was 3,40,656 hect. This would have been much higher but for the drop to 3,35,680 hect. in the famine year of 1877-78 and 3,00,014 hect. in 1880-81 caused by the failure of rains. Between 1886-87 there was considerable decrease in cultivated area because of floods in low-lying tracts. The average for the next ten years (1887-88 to 1896-97) was 3,22,456 hect. The famine year of 1896-97 marked the anti-climax, the area under tillage being 2,98,469 hect. In the succeeding decade the conditions steadily improved. The average area under cultivation was 3,28,966 hect. The percentage of increase varied in different tahsils. Ghatampur and Pukharayan, the poorest and most precarious tahsils, show an average of 62.18 and 58.98%, respectively and next follow Derapur with 58.76 and Narwal with 55.16% of the total area. The proportion of cultivated land was only 48.91% in Bilhor and 53.28% in Sheorajpur which form the richest and most highly tilled portion of the district. The total cultivated area in Akbarpur tahsil was 52.87 and in Kanpur 52.07%.

Double Cropping

In the *Settlement Report* of 1840 no mention was made of double cropping but the *Settlement Report* of 1870 mentions that the area bearing a double crop was 17,941 hect., thus, bringing the total cultivated area to 3,65,957 hect. The increase in double cropping area during subsequent years has been very striking. For the ten years ending with 1885-86 the total average was 3,72,804 hect. and that of double cropped area 32,270 hect. For the next decade the average of the total area was 3,72,783 hect. and of the double cropped area was 50,237 hect. The average area cropped for the ten years ending with 1906-07 was 3,88,514 hect. and the area bearing a double crop averaged 70,154 hect.

Thus we see a steady increase in the area of double cropping and this suggests that an apparent decline in actual area under plough does not necessarily involve a reduction in the cultivation area.

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Table 19.

Land Use Pattern (in hect.)

Item	*1969-70*	*1975-76*
Forest	11,838	11,999
Barren and uncultivable	64,263	61,630
Land put to noncultivable uses	43,826	48,528
Cultivable waste	5,288	5,503
Land under trees, grass and groves	15,236	13,088
Net sown area	4,32,045	4,29,657
Net sown area more than once	88,446	88,474
Total *kharif* area	2,43,094	2,28,920
Total *rabi* area	2,74,864	2,86,070
Total *zaide* area	2,533	3,141

Harvest

The cultivators divide the agricultural year into three seasons each of which has its own distinctive group of crops : *kharif* (rainy season), *rabi* (winter), and *zaid* (summer). The last one is economically less important than the other two. The area of *zaid* was not shown separately until 1879-80 when it was just 460 hect. The average for following six years was 843 hect. Since then the *zaid* area increased steadily and the average for 1886-87 to 1895-96 was 1,751 hect. In the next ten years ending with 1906-07 the average had gone up to 2,283 hect.

Of the two main harvests—*kharif* and *rabi*—the area varied according to the nature of the seasons. At the first survey which followed closely the famine of 1837, the areas were 1,39,249 hect. for *kharif*, and 1,21,358 hect. for *rabi*. At the time of the next settlement (1874) the *kharif* area was 1,66,913 hect. and *rabi* 1,96,547 hect. From this it would appear that the relative position of the harvest has altered. But the fact is that while the *rabi* area remains more or less constant, the area of *kharif* keeps fluctuating with the seasons. During the ten years ending with 1885-86 the average of *rabi* crops was 1,84,882 hect. and *kharif* 1,87,492 hect. The area of *rabi* crops would have been much larger but for the failure of inadequacy of rains in 1877 and 1880 when the area dropped to 1,67,976 and 1,50,162 hect., respectively. In the ensuing decade *rabi* average was 1,91,426 hect. and the variations were seldom great, while that of *kharif* was 1,79,606 hect., the lowest being 1,42,027 hect. in 1888-89 in contrast to 1,93,311 hect. in 1885-86.

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From 1896-97 to 1900-01 the *rabi* average was 1,96,794 hect. whereas the *kharif* average was 1,98,547 hect.

The above analysis shows that in spite of the artificial means of irrigation, adverse seasonal conditions do not fail to exert an immense influence on the area of cultivation.

Rabi Crops

Rabi crops consist mainly of wheat, barley and gram, sown either alone or in combination. The thirty years (1876-77 to 1906-07) average shows that the area under pure wheat was 25,756 hect. or 13.3% of the total *rabi* area. The proportion is generally higher in the tahsils along the Ganga. The maximum (28.05%) accounts for Sheorajpur and minimum is for Ghatampur (1.17%). Barley is seldom sown alone and the same may be said of gram. Barley and gram combined average 90,061 hect. or 46.53% of the total *rabi* area. Wheat mixed with gram or barley constitutes 26.3% covering 50,679 hect. Gram separately covers an area of 15,315 hect. or 7.91%. Thus, these three crops aggregate 94.05% of the entire *rabi* area, including the mixture known as *gujai* where the three are sown together. In the remaining area crops like peas, potatoes, vegetables and other garden crops are sown.

Kharif Crops

Kharif crops are more diversified and the local distribution is considerably more varied. The bulk consists of large millets (*jwar* and *bajra*) and cotton sown in combination with a pulse known as *arhar*. The thirty years' (1876-77 to 1906-07) average shows that in the foremost place came *jwar* and *arhar* averaging 83,777 hect. or 42.2% of the total *kharif* area. The proportion ranges from 26.58% in Bilhor to 55.84% in Kanpur tahsil. On poor soils *bajra* takes the place of *jwar* and this in combination of *arhar* averages 18,104 hect. or 9.12% of the total *kharif* area. The figure is as high as 21.19% in Pukharayan and as low as 3.5% in Sheorajpur. Rice is cultivated in all the tahsils and the average land under it is about 8.8% of the total *kharif* area. Nearly half of the total rice cultivating area is accounted by tahsils of Bilhor and Sheorajpur.

The other important crops grown are cotton, maize, sugarcane and garden crops like pan.

Pattern of Agriculture

Throughout the Ganga-Yamuna doab the *fasli* (agricultural) year begins with the month of *Asarh* (June-July). On the soil moistened by the first fall of the annual monsoon rains, farmers sow their *kharif* crops; first, early *dhan* (paddy) where the land is low-lying and the water supply is abundant. On the drier and elevated land, small millet and maize are sown. Later in the month other staples

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like *jwar* and *bajra* and pulses like *urad*, *mash* and *moong* are sown. In the wet tracts *jarhan* (transplanted paddy) is sown. In addition to these food grains, later *kharif* sowing also includes cotton and indigo which need a lot of attention. The harvesting of *kharif* is spread over the months of *Bhadon*, *Kuar* and *Kartik* (September-November). Where the soils are rich enough to stand intensive cultivation, the crops of the second harvest of the year—*rabi* crops—are sown in the plots cleared of the previous harvest. Such rich *dofasli* (double cropped) land was confined to a small portion of cultivated area. *Rabi* crops are commonly sown on plots set aside for that harvest and prepared while *kharif* crops ripen. The chief *rabi* staples—wheat, barley and gram—are usually sown in a mixture of two or three crops per plot. They need light rains during *Kuar* (September-October) for their germination and further showers during *Aghan* and *Pus* (December-January) bring them to maturity. *Rabi* harvesting lasts throughout the months of *Chait*, *Baisakh* and *Jeth* (March-May).

The cropping pattern of staples follows the natural conditions of each locality. The variety of soils of each locality and the extent to which irrigation is available determines the pattern of agricultural production. Where the water is far from the surface and irrigation consequently difficult, *kharif* exceeds *rabi*; only a small area is sown with wheat and a large area is sown with gram. Where natural soil conditions are good *jwar* is grown extensively and bajra only nominally and in dry areas paddy is not grown. Further, where water available for irrigation is brackish sugarcane is very rarely grown.

For the successful exploitation of these varying conditions farmers depend on adequate and timely rainfall to secure a full return on the season's sowing. Unevenness in the rains brings sudden and drastic changes. Scarcity can follow within the space of a season. More important than the adequacy and inadequacy of the aggregate rains is its precise distribution over the rainy months—a fact which rainfall figures conceal. "A small amount of light and frequent drizzle, which gently and safely permeates the soil and freshens crops, is far more useful than many times the amount coming down in heavy and rapid showers, in which the water runs away without doing any good . . . . The distribution of rain is more important than its amount" (NWP 1882-83 : 2).

The extreme dependence of agriculture on rain can be seen in Table 20. The irregularity of seasonal imbalance is the norm. Between the two extremes of severe flood and severe drought, climatic conditions fluctuate so much from season to season that statistics which claim to present an average year are rendered meaningless. Reid's (1881 : 141) comment on the seasonal vagaries with which Azamgarh cultivators had to deal during 1860s and 1870s and even today may be quoted as typical for the Uttar Pradesh as a whole : "A favourable year all round is rare. Most seasons are as faulty in respect to some crops, and some seasons are as nearly altogether unfavourable for all produce as others are altogether auspicious.

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Probably 25 per cent of the estimated full produce would not be too much to set against the vicissitudes of season" (Reid 1881 : 141).

Table 20.

The Fasli Year

(After Whitcombe 1972, Appendix 1)

Fasli months	*Corresponding month of Luni-solar calender*	*Corresponding English calender months*	*Distribution of significant climatic disorder*
Asarh	3rd month	June-July	Delay in rains : kharif sowing delayed. Failure of rains : kharif lost.
Sawan	4th month	July-August	
Bhadon	5th month	August-September	Heavy rains : ripening kharif damaged.
Kuar	6th month	September-October	
Kartik	7th month	October-November	Failure of rains : no rabi sowing, except on irrigated land.
Aghan	8th month	November-December	
Pus	9th month	December-January	Failure of rains : rabi lost, except on irrigated land.
Magh	10th month	January-February	
Phagun	11th month	February-March	Rain or heat storms : ripening rabi damaged
Chait	12th month	March-April	
Baisakh	1st month	April-May	
Jeth	2nd month	May-June	

Then, how did the farmers cope with the problems constantly posed by this degree of seasonal uncertainty, as well as with the wide divergences in productivity of soils and facilities for irrigation ? As the most comprehensive means of safeguarding against total loss, two, three or even four crops, each season, were commonly sown together within a single plot. It was the hope that "if one crop is injured or fails, they can fall back on the other" (Porter 1887 : 20).

Irrigation

The power of the monsoon over the life and death of the people is immense. Riding through the areas covered by tahsils of Khair, Chandaus and Tappal of Aligarh district during the drought of 1860-61 Colonel R.B. Smith (1861 : 301) was struck by "the forelorn dreariness of its appearance. Usually it is in parts a

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fertile country, but when I traversed it in March 1861, a few scattered plots of culture represented the broad fields one was accustomed to ride through. The country seemed denuded of inhabitants and emigration had been extensive". Eight months later the landscape had been transformed. Abundant and, more important, timely rainfall had replaced the bare patches and stunted crops with rich vegetation of a promising *rabi* harvest (Webster 1861).

The various canals supply an average 65.77% of the total irrigation, the wells 29.27% and other sources including tanks, *jhils*, and streams 4.96%. The proportion of well irrigation varies immensely in different tahsils. In Pukharayan, wells supply only 0.42% while in Kanpur and Narwal they irrigate 53.14% and 58.25% respectively. The figures for Derapur and Bilhor are 31.42% and 40.23% respectively while in Akbarpur it is 27.7%, Sheorajpur 19.5% and Ghatampur 11.93%. The tracts chiefly dependant on canals are in Pukharayan—97.44% of irrigation. The areas of the smallest supply are Narwal with 35.95% and Kanpur with 43.05%.

The history of canal irrigation in this district dates from the commencement of the Ganga Canal in 1842. The Ganga Canal waters the areas of Bilhor, Sheorajpur, and Kanpur through its numerous distributaries. The canal first touches the district in Bilhor tahsil and flows in a south-easterly direction through Bilhor, Sheorajpur and Kanpur tahsils, eventually tailing into the Ganga in Kanpur cantonment after a course of about 65 km. Of the distributaries on the left the most important ones are Sheorajpur, Taktauli, and Kalyanpur. Of the right bank distributaries, important ones are Kansua, Madhopur and Haluakhada.

Another important canal is the branch of the Ganga canal known as the Fatehpur branch. It waters the tahsils of Kanpur and Narwal with the help of several distributaries.

The above-mentioned canals are mainly confined to the tahsils along the Ganga. To irrigate the area along the Yamuna another canal was constructed which is known as the Etawah branch. It was commenced in 1850 but the work was completed in 1871. This canal irrigates the tahsils of Derapur and Akbarpur. The Ghatampur distributary, which is a branch of this canal, irrigates the areas of Ghatampur tahsil. In the tahsil this canal runs almost parallel to the Rind. The Bhoganipur branch enters the district at mile 140 and terminates at Alampur. The canal provides water for the area between the Yamuna and Sengur.

The facilities for irrigation by means of wells vary with the depth of the water level, although other factors, such as the nature of the sub-soil and the influence of the percolation from the canal, which affect the stability of the wells, have to be taken into account. The water level is highest in the tracts along the Ganga where it ranges from 6 to 8 m. while in the tahsils along the Yamuna it is

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18 to 25 m. or even more. In the areas along the Yamuna even to draw the water for domestic use requires great effort.

Other sources of water supply are comparatively unimportant, and the area watered from them does not exceed 6% of the total irrigated area except in Bilhor tahsil where 5,000 acres are irrigated, on an average, from tanks, swamps and streams.

Under the existing conditions in the last quarter of 19th century the district was well provided with the means of irrigation. Canals had brought a great relief to the precarious areas of the high and broken land adjoining the rivers particularly Yamuna, Sengur and Rind. In the 1901 census 383 villages were classified as precarious on account of their deficient water supply. Those along the Yamuna comprised 148, along the Sengur 48, along the S. Non 33 and along the Ganga 46. These make up two-thirds of the total and among the rest were villages on the banks of Isan in Bilhor and of Rind. Apart from these, the large unirrigated tract was only in Pukharayan, especially in the tract between the Sengur and the railway line.

Because of the wide fluctuations in the nature of the seasons and the amount and distribution of rainfall, the estimate of the irrigated area for a single year will not reflect the general acreage. An accurate estimate of irrigated area can be obtained from an average of the actual areas irrigated during a fairly long period. Unfortunately no figures are available for the period prior to 1884-85. For 1884-85 and 1885-86 the mean area watered was 1,29,725 hect. or 27% of the total area under tillage. During the ten years ending with 1895-96 the average was 89,891 hect. or 27.8% of the total cultivated area. During this decade there had been a relative increase in the irrigated area but the average came down because of the exceptionally wet season during the year 1894-95 when the irrigated area dropped to 37,678 hect. or only 9.1 per cent of the total land under cultivation. For the decade ending with 1906-07 the average irrigated area was 1,21,483 hect. or 36.9% of the total area cultivated. The increase had been totally due to the enhanced supply of water from canals.

Most of the irrigation took place in the fields sown with *rabi* crops, but there was a good amount of *kharif* irrigation also. The total for kharif came to about one-fourth of the net irrigated area.

The proportion of the area irrigated to the total area under tillage varied in different tahsils but it was highest in the Ganga tracts. The average (from 1884-85 to 1906-07) was as high as 50.77% in Sheorajpur, 41.77% in Bilhor and 37.9% in Kanpur. The other two tahsils which had a good percentage of irrigated land were Akbarpur with 45.93% and Derapur with 42.2%. Elsewhere the ratio was below general average, Narwal having 34.36%, Pukharayan 27.15% and Ghatampur only 21.28% of their total cultivated areas.

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Impact of Irrigation

We do not have any detailed analysis of the impact of irrigation for the early period except for the general statements of increasing prosperity due to canal irrigation. Tiwari's (1973) work of understanding the relationship between the holdings and input and output brings out the following conclusions (the enquiries were based on four sizes of farms—below 1 hect., 1-2 hect., 2-3 hect. and above 3 hect.) :

1. Average size (below 1 hect. and 1-2 hect.) of holding is higher in irrigated areas as compared to unirrigated areas.

2. Percentage of area under food crops on irrigated farms is lower (79.48%) as compared to unirrigated farms (87.7%). Percentage under non-food crops shows a reverse trend being 20.52% and 12.3% for irrigated and unirrigated farms respectively.

3. Average number of draft cattle is more on irrigated farms (1.87) as compared to unirrigated farms (1.66), while the number of milch cattle is more on unirrigated farms (1.91) as compared to irrigated ones (1.21).

4. Average cost of maintenance of bullock per hour unit is lower on the irrigated farms (Rs. 1.09) than on the unirrigated farms (Rs. 1.21). Also as the size of holding increases the cost of maintenance decreases in both irrigated and unirrigated holdings.

5. Average bullock labour utilization per hectare is more on irrigated farms (454 hours) than on the unirrigated farms (344.25 hours). This decreases with the increase in the size of farms.

6. Average human labour utilization on irrigated farms is more (1,462.5 hours) as compared to unirrigated farms (1,241.25 hours). As the size of farms increases the utilization of human labour decreases in both the cases.

7. Average cropping intensity is higher on irrigated farms (158.05%) than on unirrigated farms (116.37%). The intensity of cropping is directly correlated with the size of farms. As the size increases the intensity of cropping decreases.

Table 21 shows the average factor-wise break up of input per hect. for holdings of different sizes on irrigated and unirrigated farms. From the table it is evident that the input cost per hect. decreases as the size of holding increases in both the cases. On the irrigated holdings input cost is 13 32% more than that on unirrigated holdings.

Table 21.

Average Factor-Wise Break-up of Input and Output Per Hectare in Different Size of Holdings on Irrigated and Unirrigated Holdings

(in rupees) (After Tiwari 1973)

Particulars	*Irrigated*					*Unirrigated*				
	Size group in hect.					*Size group in hect.*				
	Below 1.0	*1-2*	*2-3*	*above 3*	*Average*	*Below 1.0*	*1-2*	*2-3*	*above 3*	*Average*
Human labour	457.65	305.69	286.56	242.92	323.21	354.38	248.62	255.09	232.75	281.71
Bullock labour	852.18	436.64	386.38	334.54	502.39	634.74	498.44	339.86	246.91	429.99
Seed	153.71	152.12	134.47	126.43	141.69	68.58	81.58	81.53	77.00	77.17
Manure	129.92	95.32	53.21	33.43	77.23	66.67	62.93	39.41	25.29	48.58
Fertilizer	23.94	17.39	15.45	17.79	18.64	—	—	4.58	—	4.58
Irrigation	32.68	29.23	22.37	31.33	28.90	—	1.23	3.33	—	1.14
Rent	16.65	16.04	15.19	8.40	14.07	9.43	10 20	8.79	4.79	8.30
Over-head changes	430.95	242.08	234.92	181.59	272.39	329.51	290.22	108.91	95.94	206.15
Total	2,093.68	1,294.33	1,148.57	976.47	1,378.26	1,463.31	1,229.22	841.50	682.68	1,054.17

Table 22

Input, Output, Net Income, Family Labour Income, Farm Labour Income on Irrigated and Unirrigated Holdings Per Hectare Under Different Size Groups

(in rupees) (After Tiwari 1973)

Size group in Hectare	*Irrigated*						*Unirrigated*					
	Input	*Output*	*Net Income*	*F.L.I.*	*F.L.I.*	*Input output ratio*	*Input*	*Output*	*Net income*	*F.L.I.*	*F.L.I.*	*Input output ratio*
Below 1 Hect.	2,093.68	2,800.87	807.19	1,216.19	1,433.71	1 : 1.33	1,463.31	1,801.17	337.86	665.86	776.66	1 : 1.23
1-2 Hect.	1,294.33	2,120.70	826.37	1,036.42	1,150.80	1 : 1.63	1,229.22	1,630.46	401.24	645.74	806.17	1 : 1.32
2-3 Hect.	1,148.57	2,197.26	1,048.69	1,213.07	13,337.86	1 : 1.91	814.50	1,348.07	507.43	705.43	746.31	1 : 1.60
above 3 Hect.	976.47	1,717.19	740.72	757.72	890.97	1 : 1.75	863.68	1,010.97	328.29	408.79	651.77	1 : 1.48

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Table 22 shows input, output, net income, family labour income and farm business income on irrigated and unirrigated holdings per hect. under different size groups. It shows that the net income, family labour income and farm business income are always greater on irrigated holdings in comparison to unirrigated holdings. Further, on irrigated farms both input and output per hect. are higher than on unirrigated farms. The table also reveals a higher input-output ratio on irrigated farms as compared to unirrigated farms, i.e., 1 : 1.65 and 1 : 1.41 respectively.

While irrigation has been a major factor in the improvement of rural economy it has also caused some harm beyond repair (Whitcombe 1972 : 71-97). The percolation through the earthen walls of canals increased the moisture in the soils sharply and in some cases so rapidly that within a few years it led to the sub-soil saturation. The obstruction and inadequacy of drainage facilities increased the danger of flooding even high lands. Excessive rains in early *kharif* (August-September) turned the cultivated field into a lake and drowned the valuable crops. *Kachchha* wells in the field collapsed and the field became salinized. Further, due to irrigation, overcropping started without giving due consideration to the gap between the two crops. All these factors led to an increase in *usar* acreage. A large portion of cultivated land became unfit for cultivation.

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PART THREE

(V) EXPLORATIONS IN DISTRICT KANPUR
(VI) SETTLEMENT PATTERNS AND SYSTEMS

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5

Explorations in District Kanpur

"The element of luck is not least of the attractions of archaeology : rice finds, or clues to sites of the greatest scientific importance may turn up by merest chance, whereas the most elaborate and well planned excavation may fail to yield results or alternatively may throw wholly unexpected light on related problems."

—Grahame Clark
(1969 : 38)

THE collection and processing of data form the main subject of this chapter. The problem outlined in the introduction concerns the regional variation in settlement patterning through time and space. This requirement demanded that data be gathered from the entire area or in a way that would allow generalization for the whole region.

One of the aspects of settlement patterning, proposed for investigation, is the apparent variation through time in the number of the Late Harappan, OCP, BRW, PGW, NBPW and Early Historic sites. We find a gradual increase in the number of settlements from the Late Harappan to Early Historic period. The question that arises is whether this gradual increase in the number of settlements

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reflects a facet of a real process. Variation of this kind may even be the result of unplanned archaeological survey where inadequate attention is paid to sampling procedures (Possehl 1980 : 35). Conclusions drawn from such field data are relevant only when it is ascertained that the number of sites discovered for each cultural period is proportional to the number of sites which are actually present. This can be ascertained either by a complete survey of the entire region or of a restricted area thereof which can be safely taken to reflect the total area pattern. The only limitation placed on such data would arise from the sites which may have been buried due to alluviation or other geomorphic factors or may have been completely destroyed by natural or human factors and thus may no longer be recovered through surface remains. This limitation is not unusual in the discipline and archaeologists must contend with it. Here it is assumed that the forces which lead to the burial or destruction of sites are sufficiently unbiased for all the sites of different cultural periods. One can proceed towards a more realistic inter-pretation within acceptable limits of error (Possehl 1980 : 35).

The complete systematic survey of the Ganga-Yamuna doab, with an area of 69,300 sq. km., is simply beyond the capacity and resources of a single explorer. Thus, to understand the trend of regional distribution of settlements during different cultural periods an intensive exploration of a restricted area, namely Kanpur district was undertaken. Efforts were made to gather the data within a framework which will allow inferences at a regional scale.

It is important to state briefly the reasons for selecting the Kanpur district for the present study. This district forms an integral part of the doab and in regional sub-divisions it falls in the central doab. The greatest advantage that this district provided was that it is flanked by both the major rivers—the Ganga and the Yamuna—that form the doab. It is the only district which has these two rivers forming its boundary lines. Besides, there are 6 more tributaries which flow through it. Within its geographical limits there are some environmental variatians at microlevel. It was therefore expected that by intensive explorations in this district it would be possible to have a reasonable idea of the comparative influence of the two major rivers on the patterning of protohistoric and early historic settlements.

It was decided to explore the whole district which has an area of 6,167 sq. km. An intensive village to village survey was carried out during three summer field seasons from 1977 to 1979 and one winter season in 1977. Though high temperatures (45-50°C) during summer make field work a trying task, yet it is the best season for locating archaeological sites because the land is then free from standing crops and wild seasonal vegetation.

During the course of explorations greatest emphasis was laid on the locating of sites and on observing the distribution pattern of cultural remains present on them. The sites were examined from observable surface remains and from the

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exposure in erosion gullies and artificial cuts to obtain information about the thickness of deposit, stratigraphy, cultural sequence etc. without excavation. My status as Ph.D. student and consequent limitation on the facilities availabe to me precluded the conducting of excavation of any site. Data on drainage, soil types, vegetation, water sources, crops and other aspects of the environment, was gathered.

The antiquity of sites and the chronology of cultural remains found on them have been decided on the basis of occurrence of well-known and dated ceramic industries of the doab. The estimation of the total size of a site and its size during different cultural periods has been made on the basis of the area represented by the distribution of respective pottery type.

For locating sites I have relied upon Survey of India maps of 1 : 63,360 (1918 edition) and on local informants. Since the exploration proceeded from the one village to the adjacent village the possibility of any site remaining unlocated was considerably reduced. Further, since the survey was done during summer months the sites which are now rendered flat by erosion or cultivation could also be located with precision.

The total area explored measures about 5,100 sq. km. An area of about 1,000 sq. km. could not be explored, except along the bank of the Ganga, as it is occupied by the sprawling city of Kanpur.

During the explorations 150 sites were located (including 27 reported earlier). On the basis of distinctive pottery types found on the sites following cultural sequence emerges from the area of intensive explorations :

A=Black-and-Red Ware (BRW)

B=Painted Grey Ware (PGW)

C=Northern Black Polished Ware (NBPW)

D=Early Historic Period (Post NBPW period represented by Red Slipped Ware).

Tables 23 and 24 at the end of this chapter give a full list of sites and concise information regarding their location, cultural content and size during different periods. The sites are alphabetically arranged and their serial numbers remain constant throughout the book. A brief information about the site and the antiquities found on them has been given in appendix 1.

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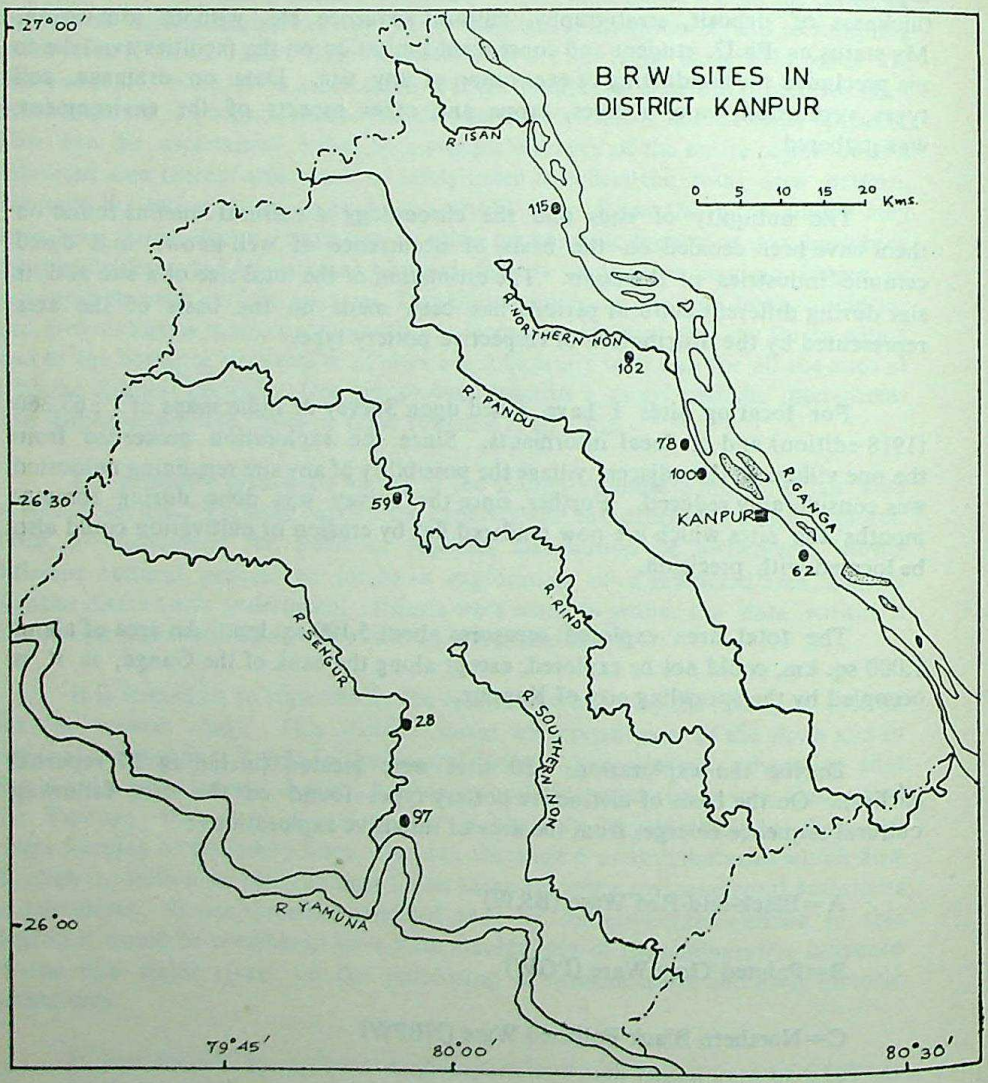

FIG. : 19

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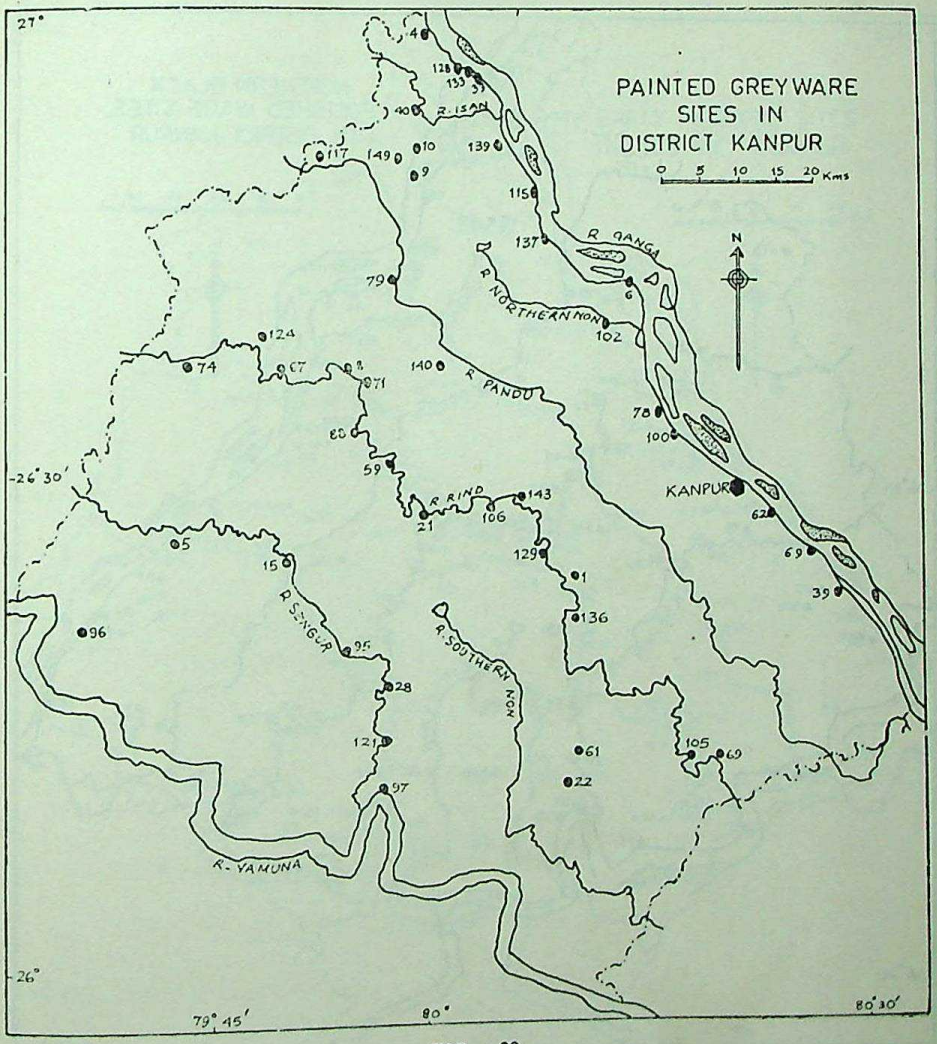

FIG. : 20.

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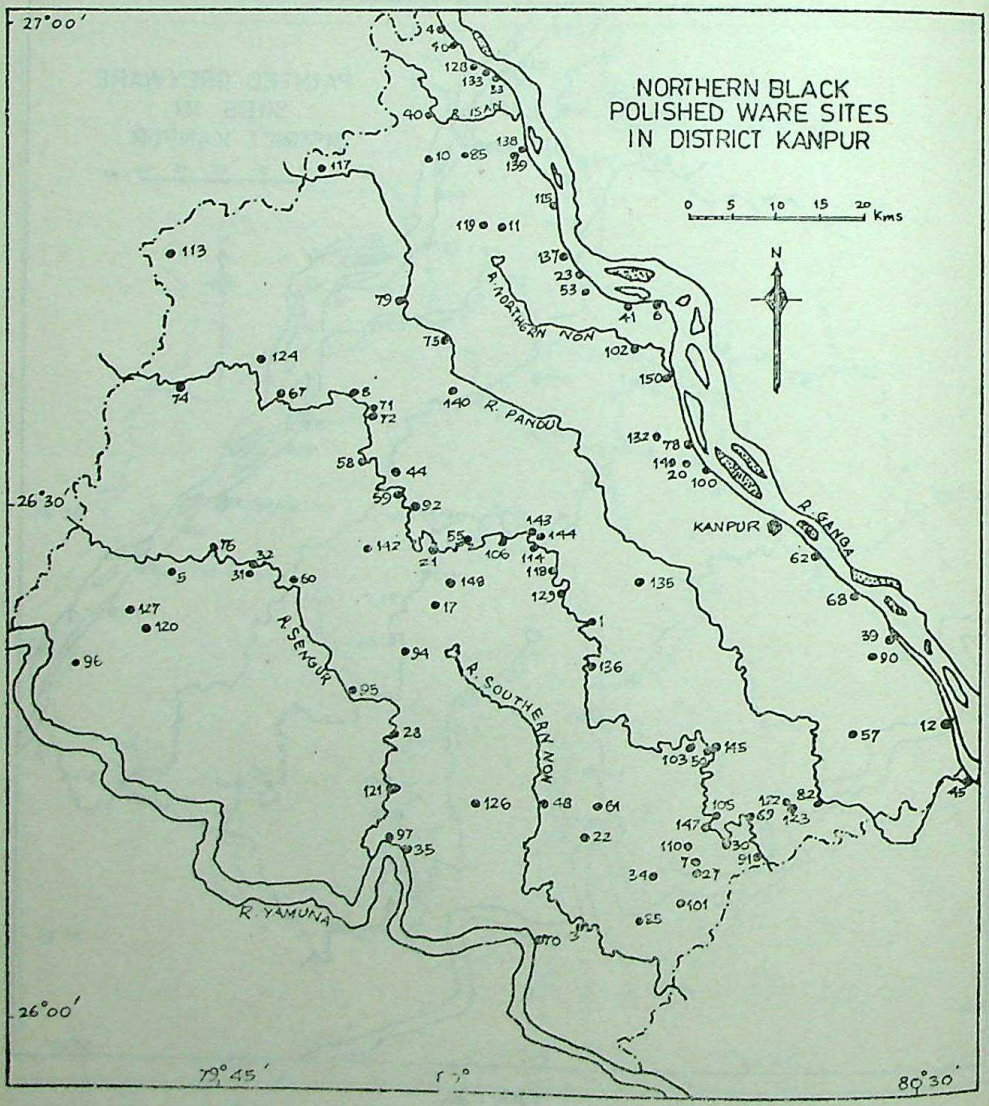

FIG. : 21.

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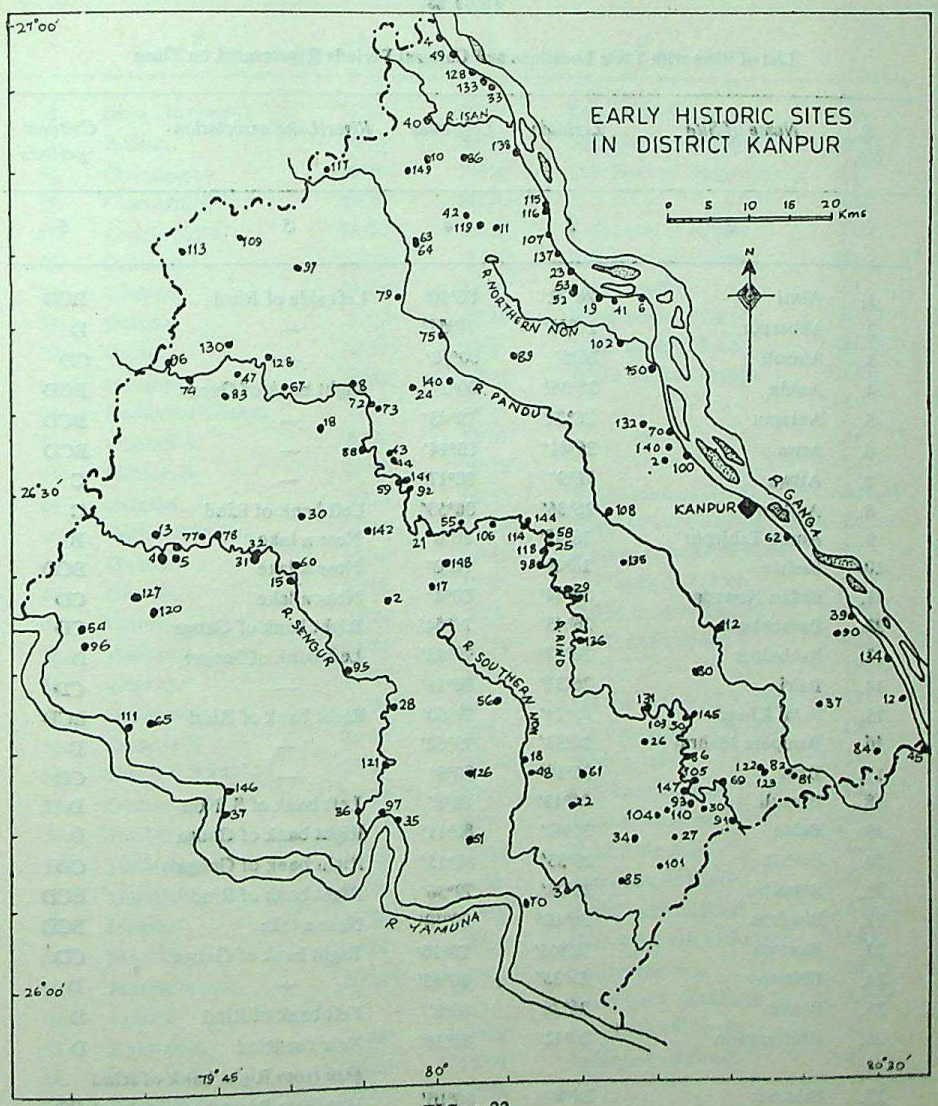

FIG. : 22.

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Table 23.

List of Sites with Their Locations and Cultural Periods Represented on Them

S. No.	*Name of Site*	*Latitude*	*Longitude*	*River/Lake association*	*Cultural periods*
1	*2*	*3*	*4*	*5*	*6*
1.	Ainti	26°22′	80°10′	Left side of Rind	BCD
2.	Akbarpur	26°23′	79°57′	—	D
3.	Amauli	26°5′	80°10′	—	CD
4.	Ankin	26°56′	80°2′	Right bank of Ganga	BCD
5.	Antapur	26°24′	79°43′	—	BCD
6.	Atwa	26°41′	80°14′	—	BCD
7.	Attwa	26°9′	80°17′	—	C
8.	Aujhan	26°36′	80°55′	Left bank of Rind	C
9.	Auran Tahirpur	26°47′	80°0′	Near a lake	B
10.	Bachna	26°49′	80°0′	Near a lake	BCD
11.	Badan Newada	26°44′	80°4′	Near a lake	CD
22.	Badshahpur	26°45′	79°54′	Right bank of Ganga	CD
13.	Bahbalpur	26°27′	79°42′	Left bank of Sengur	D
14.	Bairi	26°32′	80°16′	—	CD
15.	Balai Khurd	26°23′	79°50′	Right bank of Rind	BCD
16.	Banipara Mahraj	26°33′	79°52′	—	D
17.	Bara	26°18′	80°9′	—	CD
18.	Barauli	26°13′	80°8′	Left bank of S. Non	D
19.	Behta	26°42′	80°11′	Right bank of Ganga	D
20.	Berhat	26°35′	80°15′	Right bank of Ganga	CD
21.	Bewaine	26°28′	79°56′	Right bank of Rind	BCD
22.	Bhadras	26°10′	80°10′	Near a lake	BCD
23.	Bhaseni	26°43′	80°10′	Right bank of Ganga	CD
24.	Bhiwan	26°35′	80°45′	—	D
25.	Bhisar	26°26′	80°8′	Left bank of Rind	D
26.	Bhittargaon	26°12′	80°16′	Near the Rind	D
				¼km from Right bank of Rind	
27.	Bihupur	26°8′	80°16′	½km from Right bank of Rind	CD
28.	Bijaipur	26°15′	79°58′	Left bank of Sengur	ABCD
29.	Binaur	26°23′	80°9′	Left side of Rind	D
30.	Birahar	26°10′	80°20′	Right bank of Rind	CD
31.	Biria Derapura-A	26°25′	79°45′	Right bank of Sengur	CD

(Contd. on next page)

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1	2	3	4	5	6
32.	Biria Derapur-B	26°25′	79°45′	Left bank of Sengur	CD
33.	Buhnar	26°53′	80°6′	Right bank of Ganga	BCD
34.	Chandanpur	26°9′	79°58′	Left bank of Yamuna	CD
35.	Chandanpur	26°30′	80°16′	—	CD
36.	Chaparghata	26°10′	79°56′	Left bank of Sengur	D
37.	Chaurah	26°10′	79°47′	Left bank of Yamuna	D
38.	Chilauli	26°28′	79°52′	Near a nullah	D
39.	Debipur	26°20′	80°30′	Right bank of Ganga	BCD
40.	Deoha	26°52′	80°0′	Right bank of Isan	BCD
41.	Durgapur	26°42′	80°11′	Right bank of Ganga	CD
42.	Gadanpur Chorsa	26°46′	80°1′	—	D
43.	Ghalon-A	26°32′	79°58′	—	D
44.	Gahlon-B	26°32′	79°58′	—	CD
45.	Galatha	26°13′	80°17′	Right bank of Ganga	ABCD
46.	Garhia Sikandra	26°26′	79°48′	Right bank of Sengur	D
47.	Gaupur	26°36′	79°47′	Near right bank of Rind	D
48.	Ghatwa	26°12′	80°8′	Left bank of S. Non	CD
49.	Gilwat	26°55′	80°3′	Right bank of Ganga	CD
50.	Gobrauri	26°14′	80°18′	Right bank of Rind	CD
51.	Gopalpur	26°27′	80°11′	—	D
52.	Guraiya-A	26°39′	80°13′	On the nullah of N. Non	D
53.	Guraiya-B	26°39′	80°13′	On the nullah of N. Non	CD
54.	Gurdahi Khurd	26°21′	79°36′	Near a lake	D
55.	Gurgaon	26°27′	80°5′	Left bank of Rind	CD
56.	Hathei	26°15′	80°5′	Near a big pond	D
57.	Hathigaon	26°16′	80°28′	Near a big pond	CD
58.	Hulasipur	26°26′	80°8′	Left bank of Rind	D
59.	Indayan	26°30′	79°57′	Right bank of Rind	ABCD
60.	Indrukh	26°24′	79°52′	Near left bank of Sengur	CD
61.	Jahangirabad	26°12′	80°11′	Near a big lake	BCD
62.	Jajmau			Right bank of Ganga	ABCD
63.	Kakwan-A	26°44′	79°59′	Left bank of Pandu	D
64.	Kakwan-B	26°44′	79°59′	Left bank of Pandu	D
65.	Kamalpur	26°16′	79°42′	—	D
66.	Kamsan	26°18′	80°2′	—	CD
67.	Kamasia	26°36′	79°50′	Left bank of Rind	BCD
68.	Karankhera	26°23′	80°29′	Right bank of Ganga	BCD
69.	Karchalipur	26°11′	80°19″	Left bank of Rind	BCD

(Contd. on next page)

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1	2	3	4	5	6
70.	Karchalipur	26°10′	79°58′	Left bank of Yamuna	CD
71.	Kashipur-A	26°34′	79°56′	Left bank of Rind	BC
72.	Kashipur-B	26°34′	79°56′	Left bank of Rind	CD
73.	Kashipur-C	26°34′	79°56′	Left bank of Rind	D
74.	Katka	26°37′	79°45′	Right bank of Rind	BCD
75.	Keilai	26°37′	80°1′	Near right bank of Rind	CD
76.	Khajuri	26°26′	79°46′	Left bank of Sengur	CD
77.	Khalla	26°27′	79°45′	—	D
78.	Kheora	26°30′	80°17′	Right bank of Ganga	ABCD
79.	Khera Kursi	26°42′	79°58′	Right bank of Pandu	BCD
80.	Khirsa	26°19′	80°16′	—	D
81.	Kisakhera-A	26°12′	80°26′	Right bank of Pandu	D
82.	Kisakhera-B	26°12′	80°26′	Right bank of Pandu	CD
83.	Kishora	26°35′	79°46′	—	D
84.	Kismara	26°13′	80°31′	—	D
85.	Kurain	26°51′	80°14′	—	CD
86.	Kurtha	26°14′	80°19′	Left bank of Rind	D
87.	Lala Bhagat	26°43′	79°51′	—	D
88.	Lamhra	26°32′	79°56′	Right bank of Rind	BCD
89.	Maharaj Nagar	26°37′	80°8′	Near a big pond	D
90.	Mahrajpur	26°19′	80°28′	—	CD
91.	Mahulia	26°8′	80°22′	Right bank of Rind	CD
92.	Mandauli	26°29′	79°59′	Left bank of Rind	CD
93.	Mathurapur	26°9′	80°21′	Near right bank of Rind	D
94.	Mati-Kishanpur	26°20′	79°58′	—	C
95.	Mawar	26°18′	79°55′	Left bank of Sengur	BCD
96.	Milanpur	26°19′	79°35′	Near a lake	BCD
97.	Musanagar	26°10′	79°58′	Left bank of Yamuna	ABCD
98.	Narainpur	26°24′	80°8′	Right bank of Rind	D
99.	Nar Khurd	26°38′	79°43′	Left bank of Rind	D
100.	Nawabganj	26°30′	80°17′	Right bank of Ganga	ABCD
101.	Nibia Khera	26°7′	80°16′	—	CD
102.	Nonha Narsingh	26°38′	80°11′	Right bank of N. Non	ABCD
103.	Padari Lalpur	26°14′	80°14′	Near a big pond	CD
104.	Pahewa	26°9′	80°16′	—	D
105.	Palahpur	26°12′	80°19′	Left bank of Rind	BCD
106.	Panchgawan	26°26′	80°6′	Left bank of Rind	BCD
107.	Panka	26°44′	80°9′	Right bank of Ganga	D

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1	2	3	4	5	6
108.	Panki	26°28′	80°13′	Left bank of Pandu	D
109.	Parsaurah	26°45′	79°47′	—	D
110.	Pasikhera	26°10′	80°17′	—	CD
111.	Pichora	26°15′	70°40′	Left bank of Yamuna	D
112.	Pipergaon	26°20′	80°21′	Left bank of Pandu	D
113.	Pooran Purwa	26°43′	79°43′	—	CD
114.	Pura Shukul	26°27′	80°6′	Right bank of Rind	CD
115.	Radhan-A	26°45′	80°8′	Right bank of Ganga	ABCD
116.	Radhan-B	26°45′	80°8′	Right bank of Ganga	D
117.	Rahimpur Bisdhan	26°49′	79°54′	Near left bank of Pandu	BCD
118.	Raipur	26°25′	80°8′	Right bank of Rind	CD
119.	Ranipur	26°45′	80°3′	—	CD
120.	Rasdhan	26°22′	79°4′	—	CD
121.	Rasulpur Bhuranda	26°12′	80°27′	Right bank of Sengur	ABCD
122.	Rataipur-A	26°12′	80°23′	—	CD
123.	Rataipur-B	26°12′	80°23′	—	CD
124.	Ratanpur-A	26°36′	79°49′	Left bank of Rind	BC
125.	Ratanpur-B	26°36′	79°49′	Left bank of Rind	D
126.	Reona	26°12′	80°16′	—	CD
127.	Rohini	26°3′	79°40′	—	CD
128.	Sajeti Badshahpur	26°54′	80°4′	Right bank of Ganga	BCD
129.	Sambhalgarh	26°23′	80°8′	Right bank of Rind	BC
130.	Salempur Mahera	26°38′	80°47′	—	D
131.	Sambhua	26°16′	80°14′	Left bank of Rind	D
132.	Sandila	26°34′	80°15′	—	CD
133.	Sanihapur	26°26′	79°47′	Right bank of Sengur	BCD
134.	Sinkim Buzurg	26°16′	80°32′	—	D
135.	Sanon	26°13′	80°17′	Rind Pandu Doab	CD
136.	Sapai	26°21′	80°12′	Left bank of Rind	BCD
137.	Sarayaganj	26°43′	80°9′	Right bank of Ganga	BCD
138.	Seng-A	26°48′	80°7′	Right bank of Ganga	CD
139.	Seng-B	26°48′	80°7′	Right bank of Ganga	BC
140.	Siddhapur Sheoli	26°36′	80°2′	Near right bank of Pandu	BCD
141.	Terhwa	26°30′	80°0′	Near left bank of Rind	D
142.	Tigaine	26°28′	79°56′	—	CD
143.	Tora-A	26°27′	80°7′	Left bank of Rind	BC
144.	Tora-B	26°27′	80°7′	Left bank of Rind	CD
145.	Turrayya	26°14′	80°18′	Left bank of Rind	CD
146.	Udaipur	26°11′	79°47′	Left bank of Yamuna	D
147.	Udaipur	26°11′	80°19′	Right bank of Rind	CD
148.	Umran	26°24′	80°2′	—	CD
149.	Uttha	26°48′	79°58′	Near a big pond	BD
150.	Valmiki Ashram	26°37′	80°16′	Right bank of Ganga	CD

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Table 24.

Size of the Settlements During Different Cultural Periods

(in sq. m)

S. No.	*Name of Site*	*Pd. A*	*Pd. B*	*Pd. C*	*Pd. D*	*Size of the present Mound*
1	*2*	*3*	*4*	*5*	*6*	*7*
1.	Ainti	—	7,000	10,000	15,000	15,000
2.	Akbarpur	—	—	—	15,000	37,000
3.	Amauli	—	—	8,000	8,000	8,000
4.	Ankin	—	15,000	30,000	60,000	60,000
5.	Antapur	—	8,000	12,000	12,000	12,000
6.	Atwa	—	11,000	11,000	21,000	21,000
7.	Attwa	—	—	7,200	—	7,200
8.	Aujhan	—	15,000	28,125	28,125	28,125
9.	Auran Tahirpur	—	6,400	—	—	6,400
10.	Bachna	—	8,000	15,000	15,000	15,000
11.	Badan Newada	—	—	4,500	8,100	11,250
12.	Badashpur	—	—	10,800	16,800	16,800
13.	Bahbalpur	—	—	—	30,000	30,000
14.	Bairi	—	—	17,500	35,000	75,000
15.	Balaikhund	—	7,200	12,500	12,500	12,500
16.	Banipara Mahraj	—	—	—	60,000	1,50,000
17.	Bara	—	—	6,650	6,650	6,650
18.	Barauli	—	—	—	10,000	10,000
19.	Behta	—	—	—	15,750	15,750
20.	Berhat	—	—	6,400	15,625	15,625
21.	Bewaine	—	6,000	12,600	21,875	21,875
22.	Bhadras	—	10,000	16,000	30,000	30,000
23.	Bhasani	—	—	24,500	43,700	43,700
24.	Bhiwan	—	—	—	10,000	10,000
25.	Bhisar	—	—	—	4,800	4,800
26.	Bhitargaon	—	—	—	30,000	30,000
27.	Bihupur	—	—	5,625	12,000	12,000
28.	Bijaipur	15,000	15,000	22,000	22,000	30,000
29.	Binaur	—	—	—	30,000	50,000
30.	Birahar	—	—	13,200	20,900	20,900
31.	Biria Derapura-A	—	—	8,000	8,000	8,000
32.	Biria Derapura-B	—	—	6,000	6,000	6,000
33.	Buhnar	—	7,000	12,500	25,000	25,000

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1	2	3	4	5	6	7
34.	Chandanpur	—	—	6,400	6,400	6,400
35.	Chandanpur	—	—	13,750	13,750	13,750
36.	Chaparghata	—	—	—	8,000	30,000
37.	Chaurah	—	—	—	19,500	19,500
38.	Chilauli	—	—	—	12,000	12,000
39.	Debipur	—	8,000	8,000	12,500	12,500
40.	Deoha	—	8,000	12,500	40,000	40,000
41.	Durgapur	—	—	6,000	9,000	9,000
42.	Gadanpur Chorsa	—	—	—	8,000	8,000
43.	Ghalon-A	—	—	—	3,500	3,500
44.	Ghalon-B	—	—	5,625	13,125	13,125
45.	Galatha	26,250	26,250	30,000	56,000	1,50,000
46.	Garhia Sikandra	—	—	—	13,750	13,750
47.	Gaupur	—	—	—	4,800	4,800
48.	Ghatwa	—	—	8,000	8,000	8,000
49.	Gilwat	—	—	22,500	30,000	30,000
50.	Gobrauri	—	—	10,000	10,000	10,000
51.	Gopalpur	—	—	—	10,000	10,000
52.	Guraiya-A	—	—	—	5,625	5,625
53.	Guraiya-B	—	—	11,000	11,000	11,000
54.	Gurdahi Khurd	—	—	—	17,500	17,500
55.	Gurgaon	—	—	7,200	7,200	7,200
56.	Hathei	—	—	—	6,750	6,750
57.	Hathigaon	—	—	8,000	40,000	40,000
58.	Hulasipur	—	—	—	8,000	8,000
59.	Indayan	7,500	7,500	1?,500	30,000	30,000
60.	Indrukh	—	—	16,250	34,000	34,000
61.	Jahangirabad	—	22,500	22,500	50,000	60,000
62.	Jajmau	30,000	30,000	50,000	70,000	?
63.	Kakwan-A	—	—	—	22,500	22,500
64.	Kakwan-B	—	—	—	2,500	2,500
65.	Kamalpur	—	—	—	14,375	14,375
66.	Kamsan	—	—	6,400	6,400	6,400
67.	Kamasia	—	18,750	30,000	45,000	60,000
68.	Karankhera	—	2,500	2,500	—	2,500
69.	Karchalipur	—	8,000	23,800	23,800	23,800
70.	Karchalipur	—	—	16,000	25,600	25,600
71.	Kashipur-A	—	3,750	3,750	—	3,750
72.	Kashipur-B	—	—	6,000	6,000	6,000
73.	Kashipur-C	—	—	—	10,000	10,000

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1	2	3	4	5	6	7
74.	Katka	—	15,000	15,000	15,000	15,000
75.	Keilai	—	—	30,000	52,000	52,000
76.	Khajuri	—	—	7,500	7,500	7,500
77.	Khalla	—	—	—	10,000	10,000
78.	Kheora	9,000	9,000	18,750	32,000	48,000
79.	Khera Kurai	—	30,000	50,000	70,000	1,60,000
80.	Khirsa	—	—	—	13,750	13,750
81.	Kisakhera-A	—	—	—	10,400	10,400
82.	Kisakhera-B	—	—	5,850	5,850	5,850
83.	Kishora	—	—	—	10,000	10,000
84.	Kismera	—	—	—	19,500	19,500
85.	Kurain	—	—	11,000	30,000	30,000
86.	Kurtha	—	—	—	10,400	10,400
87.	Lala Bhagat	—	—	—	35,000	87,500
88.	Lamhra	—	5,250	5,250	9,375	9,375
89.	Maharaj Nagar	—	—	—	12,500	12,500
90.	Mahrajpur	—	—	5,625	19,500	19,500
91.	Mahulia	—	—	5,000	5,000	5,000
92.	Mandhauli	—	—	2,400	12,000	12,000
93.	Mathurapur	—	—	—	35,200	35,200
94.	Mati-Kshampur	—	—	4,800	—	4,800
95.	Mawar	—	10,000	15,000	26,250	40,000
96.	Milanpur	—	4,800	15,625	20,625	20,625
97.	Musanagar	30,000	30,000	50,000	60,000	2,25,000
98.	Narainpur	—	—	—	5,850	5,850
99.	Nar Khurd	—	—	—	26,250	26,250
100.	Nawabganj	15,000	15,000	40,000	75,000	1,35,000
101.	Nibia Khera	—	—	8,100	8,100	8,100
102.	Nonha Narsingh	10,000	10,000	12,800	52,500	1,23,750
103.	Padari Lalpur	—	—	3,000	12,000	12,000
104.	Pehewa	—	—	—	10,000	10,000
105.	Palahpur	—	10,000	20,000	43,750	43,750
106.	Panchgawan	—	72,000	10,000	10,000	10,000
107.	Panka	—	—	—	3,750	3,750
108.	Panki	—	—	—	18,750	18,750
109.	Parsaurah	—	—	—	3,750	3,750
110.	Pasikhera	—	—	6,300	6,300	6,300
111.	Pichora	—	—	6,300	6,300	6,300
112.	Pipergaon	—	—	—	13,000	13,000
113.	Pooram Purwa	—	—	12,500	35,000	52,500

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1	*2*	*3*	*4*	*5*	*6*	*7*
114.	Pura Shukul	—	—	4,500	4,500	4,500
115.	Radhan-A	40,000	40,000	87,500	1,12,500	1,62,500
116.	Radhan-B	—	—	—	12,500	12,500
117.	Rahimpurbniasdh	—	4,500	10,000	50,000	50,000
118.	Raipur	—	12,500	12,500	12,500	12,500
119.	Ranipur	—	—	6,400	12,000	12,000
120.	Rasdhan	—	—	13,200	26,200	26,250
121.	Rasulpur Buhraand	—	6,000	12,500	18,750	18,750
122.	Ra'aipur-A	—	—	11,250	11,250	11,250
123.	Rataipur-B	—	—	4,500	10,000	10,000
124.	Ratanpur-A	—	5,850	5,850	—	5,850
125.	Ratanpur-B	—	—	—	6,400	6,400
126.	Reona	—	—	7,500	12,500	12,500
127.	Rohini	—	—	6,400	6,400	6,400
128.	Sajeti Badshahpur	—	18,750	25,000	25,000	25,000
129.	Sambhalgarh	—	6,375	6,375	—	6,375
130.	Salempur Mahea	—	—	—	6,400	6,400
131.	Sambhua	—	—	—	11,250	11,250
132.	Sendila	—	—	10,000	10,000	10,000
133.	Sanihapur	—	14,300	25,000	25,000	25,000
134.	Sinkim Brguzu	—	—	—	18,750	18,750
135.	Senon	—	—	13,000	13,000	13,000
136.	Sapai	—	8,000	8,000	35,000	75,000
137.	Sarayaganj	—	6,000	15,750	15,750	15,750
138.	Seng-A	—	—	7,800	7,800	7,800
139.	Seng-B	—	4,800	4,800	—	4,800
140.	Siddhapur oliShe	—	15,625	15,625	35,000	35,000
141.	Terhwa	—	—	—	13,750	13,750
142.	Tigaine	—	—	18,750	18,750	18,750
143.	Tora-A	—	3,750	3,750	—	3,750
144.	Tora-B	—	—	15,400	15,400	15,400
145.	Turrayya	—	—	6,000	6,000	6,000
146.	Udaipur	—	—	—	40,000	40,000
147.	Udaipur	—	—	15,000	60,000	60,000
148.	Umran	—	—	18,750	26,250	26,250
149.	Uttha	—	4,800	—	20,800	20,800
150.	Valmiki Ashram	—	—	12,000	12,000	12,000

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6

Settlement Patterns and Systems

"No culture has achieved so perfect an adjustment to its environment that it is static. The differences which appear in successive periods during the development of culture in any locality entail not only increasing complexity, or quantitatively new patterns, but also qualitatively new patterns."

—Julian H. Steward
(1955 : 5)

THE present chapter deals with the settlement patterns and systems in the Kanpur district during proto-historic and early historic periods. Data gathered in the field have been utilized to draw inferences about the way early colonisers of the area organised themselves in respect of their physical and cultural environment.

The chapter consists of seven sections. Section one gives a brief summary of the origin and development of the concepts of settlement patterns and systems in archaeology. Sections two and three are concerned with the distribution and spacing pattern of the settlements. Sections four and five deal with the nearest-neighbour analysis and the development of hierarchy. In section six an attempt has been made to estimate population of the district during different cultural

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periods. The last section presents a probable etchment-area model for settlement, taking the site of Radhan as an example.

Development of the Concept of Settlement Pattern and Systems in Archaeology

The study of settlement patterns is one of the most interesting branches of enquiry in the field of archaeology. It is mainly a study of spatial distribution of human activities and occupations ranging from different locations of activities within a single room to the arrangement of sites in a region. Because they are concerned with locational information, settlement studies use features and sites as their data bases.

The beginning of settlement pattern studies is generally traced back to the work of L.H. Morgan (Parson 1972) in the last century. Morgan's (1881) work was mainly concerned with the question of how the remains of aboriginal residential architecture in North America reflected the social organization of the prehistoric people who occupied them. Though Morgan's work had several inadequacies, the fact remains that he was the first scholar who made an effort to grapple with a series of complex questions which had seldom been asked before.

At the end of 19th century Mindeleff (1900) was another anthropologist who conducted a series of investigations into the sociology of architectural remains. On the basis of ethnographic analogy he offered an interpretation of settlement accretion and growth and presented a method for reconstucting occupational chronology and settlement composition from archaeological remains (Parson 1972 : 128). The provocative problems and hypotheses proposed by Morgan and Mindeleff remained unnoticed for nearly 40 years until Julian Steward (1937, 1938) published his two important studies on aboriginal social organisation in North America. In his studies Steward recognized that patterns in the location of household residences could be understood as a product of interaction between environment and culture, especially, in the latter case, the factors of technology and social organisation. In other words, the spatial patterning of archaeological features that represented ancient residences could be analysed in order to reconstruct the past decisions regarding the use of the environment, allocation of resources, social relationships and the like. Almost around the same time Cyril Fox's (1932) *Personality of Britain* was published in which he related the distribution of archaeological sites to the distribution of environmental features. Subsequently many more studies on similar lines came out (Childe 1934; Grimes 1945; Hoggs 1943). Still, there was no significant breakthrough in the studies of settlement patterns.

Deriving inspiration from Steward's work G.R. Willey carried out researches in Viru Valley. With the publication of Willey's (1953) *Prehistoric Settlement Patterns in Viru Valley* there came a major breakthrough in the field of archaeology. Willey on his part acknowledged an intellectual debt to Julian Steward.

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Willey's was the first study in archaeology which aimed explicitly at inferring a cultural process from the regional patterning of settlements. Willey not only stressed the need of settlement studies but also defined their scope and potential utility in archaeology. He defined settlement pattern as : "the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement and to the nature and disposition of other buildings, pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated and various institutions of social interaction and control which the culture maintained. Because settlement patterns are, to a large extent, directly shaped by widely held cultural needs, they offer a strategic starting point for functional interpretation of archaeological cultures" (Willey 1953 : 1).

Willey's work, for the first time, offered a systematic methodological framework for a conjunctive approach. The publication of the Viru Valley report marked the beginning of a new approach in archaeological research and it inspired a number of new studies. These studies were not simply descriptive in nature but were also concerned with methodological and theoretical questions. The increasing interest of American archaeologists in this branch of study was illustrated in the publication of *Prehistoric Settlement Patterns in New World* (Willey 1956). The papers by different authors in this volume showed diverse orientations and lack of a common scope and goal of settlement studies. Willey, however, expanded his earlier discussion and emphasized that "settlements are a more direct reflection of social and economic activities than are most other aspects of material culture available to archaeologists and this kind of study does not constitute a separate approach to archaeology but is, together with chronological work and other essentials only a necessary part of archaeology whose role has not been so far stressed" (Willey 1956 : 1). He insisted that settlement studies should not be treated as a closed and self-contained system or method but as a part of the total archaeological operation.

Vogt (1956) stressed the significance of settlement pattern investigations as a point where archaeologists, ethnologists and geographers could meet to contribute their respective expertise to the common problems. He formulated the scope of settlement pattern study as a description of :

1. the nature of individual domestic house type or types;
2. the spatial arrangement of these domestic house types with respect to one another within the village or community unit;
3. the relationship of domestic house types to other spatial architectural features;
4. the overall village or community plan; and
5. the spatial relationships of villages or communities to one another over as large an area as feasible (Vogt 1956 : 174-75).

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Vogt saw three kinds of interrelated interpretations as most appropriate :

"One which explores the relationship of living arrangements to geographical features such as topography, soils, vegetation types or rainfall zones; a second which focuses upon the social structural inferences that can be made about sociopolitical and ceremonial organisation; and a third which concentrates upon the study of change through time with a view to providing materials for generalizing about the culture proceses" (Vogt 1956 : 175).

Sanders (1956) introduced the concept of symbiotic regions into the archaeological literature. He gave more emphasis on analysing the distribution of human settlements in the context of agricultural systems, local specialization and inter-regional exchange. He distinguished between community settlement pattern and zonal settlement patterns. He elaborated that the community pattern comprises "the individual units of population, including such data as types of communities, organisation of public buildings, streets and population distribution and form, density of community population, and character of resident population. It would also include house types and solar organisation." The zonal settlement patterns, according to him, are "concerned with the distribution of community sizes, distances between communities, density of population and the symbiotic interrelationship between communities" (Sanders 1956 : 116).

Following the publication of *Prehistoric Settlement Patterns in New World* a number of other studies came out dealing with different geographical areas of the world (Adams 1961, 1965; Bulhm 1960; Bullard 1960; Dittert 1961; Herold 1961; Martin *et al.* 1962, 1964; McIntire 1958; Sanders 1960, 1965; Sears 1961; Willey *et al.* 1965).

The late fifties also saw a growing awareness among American archaeologists of the utility of ethnographic analogy in the settlement pattern interpretation (Coe 1957; Miles 1957; Willey 1958). However, Chang (1958) made the first serious attempt to generate and test hypothesis concerning the relationship between social organisation and settlement patterns in simple neolithic societies (non-stratified groups practicing subsistence agriculture). He made an important distinction between the two meanings of the term 'settlement pattern'—settlement pattern and community pattern. He defined settlement pattern as "the manner in which human settlements are arranged over the landscape in relation to physiographic geographic environments" and community pattern as "the manner in which the inhabitants arrange their various structures within the community and their communities within the aggregate" (Chang 1958 : 299). By the term aggregate Chang means "a gathering of certain number of communities which are bound by close social, political, commercial or religious ties" (Chang 1958 : 299-300).

Further contribution to settlement archaeology was made by Roul Narroll (1962) and Cook and Heizer (1965, 1968) and several others. They attempted to establish the quantitative relationship between settlement size and population.

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In the mid-sixties archaeologists started realizing the methodological and analytical limitations of the definitions and concepts used in settlement pattern studies. As a result in the sixties and seventies much emphasis was laid on developing more rigorous techniques to search for structures in the spatial distribution of archaeological data. A part of this new emphasis has resulted from a theoretical reorientation in the view that the study of relationships among artifacts, ecofacts and features is also important as the study of artifacts, ecofacts and features themselves. But by and large the change is due to increasing attention archaeologists now pay to other social sciences, especially geography and ethnography.

One of the most significant contributions to the field of settlement pattern studies has been the development of the concept of 'settlement system', a refinement of Chang's (1962) 'annual subsistence region'. Winters (1969 : 105) made an explicit distinction between settlement pattern and settlement system. According to him settlement pattern is "the geographic and physiographic relationship of a contemporaneous group of sites with a single culture", whereas settlement system "refers to the functional relationship among the contemporaneous group of sites within a single culture" (Winters 1969 : 110). In other words, settlement system is "a set of rules" that generated the pattern (of settlement). Settlement system cannot be empirically derived but at least some of the rules can be deduced by simulation or the use of probabilistic models (Flannery 1976 : 162).

There were also several attempts to redefine the scope and goal of settlement archaeology. Trigger (1967) defined settlement archaeology as "the study of social relationships using archaeological data." Chang (1972 : 7) points out that the "social relationships could also be regarded not as the goal for study but as the elements of a methodological framework." He defines settlement archaeology as "the archaeological methodology in which settlement components considered as *loci* of the past activities, serve as the primary units for classification" (Chang 1972 : 7). Thus, Chang regards settlement archaeology as the study of archaeological data in a framework of social relationships. Rouse (1972), a critic of Chang's approach to settlement archaeology, however, says that the archaeologist can never recover an entire settlement pattern as it is observed by a geographer or ethnographer. We, the archaeologists find only traces of it which have survived as archaeological remains. He prefers to use the expression *remnant settlement pattern* "in order to distinguish it from the full settlement pattern which is observed by the ethnographer or geographer". He says that a remnant settlement pattern "is to its full settlement pattern as a fossil skeleton is to its living counterpart. The archaeologist bases his reconstruction of the full pattern on its remnant in the same way that the palaeontologist bases his reconstruction of an animal on its fossil remains" (Rouse 1972 : 97).

The pioneering examples of settlement system studies are those of Binford (1964), Binford and Binford (1966), Longacre (1964), Hill (1966, 1970) and Wilmsen (1968). Binfords utilized factor analysis in an effort to reconstruct

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palaeolithic settlement system through the detection of the pattern of artifact variability in Mousterian assemblages from France. Wilmsen demonstrated the significant difference between the artifact assemblages of several palaeo-Indian sites in U.S.A. and suggested that a variety of different activities were performed at different sites. Longacre (1964) and Brown and Freeman (1964) after analysing the intrasite variability in ceramic assemblages suggested the presence and location of matrilocal residential groups within Puebloan community.

Settlement pattern studies by and large have revolved around the tradition initiated by Willey. The emphasis has been on extensive regional survey, within regions of several hundreds to several thousands sq. km. in order to define the extent of the system, delineate broad problems like migration and diffusion, and formulate hypotheses regarding site function, demography and polity which can be tested and redefined through subsequent intensified investigations. Inferences have mainly been drawn from the gross outlines of settlement configuration, from surface indications of differential architectural complexity within and between sites, from site locations with features and form and the changes in these variables through time.

A major breakthrough in the methodology of settlement archaeology came with the publication of two papers by Trigger (1967, 1968). For the first time a very comprehensive survey of literature concerning settlement pattern studies in archaeology, ethnology and geography was made, to understand the various approaches and levels of studies in the field of settlement archaeology. Trigger isolated two main approaches :

(a) Ecological—this approach is often based on the assumption that the settlement pattern was a product of the simple interaction of two variables—environment and technology. This approach was primarily an investigation of how the settlement pattern reflected the adaptation of a society and its technology to its environment.

(b) Sociological—in this approach the settlement data were used as a basis for making inferences about the social, political and religious organisation of cultures.

These two kinds of studies were distinguished not only by differences in approach, but also to a large degree by their choice of data. The first was concerned with the size and distribution of the total number of sites, while the second concentrated on patterning within individual settlements. Mayer-Oakes (1959 : 167) distinguished these as *community types* and *zonal pattern*, Sears (1961 : 226) as *site* and *areal pattern* referring to former as *microcosmic* and latter as *macrocosmic*. Chang (1968 : 6-7) proposed the terms *microstructure* and *macrostructure*, the former referring to the "cultural and social structure of a settlement" and the latter to the "larger cultural and social system . . . composed as they are of individual settlements". He further elaborated that "the microstructure is the model for an archaeological community reconstructed on the

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evidence from an archaeological settlement whereas macrostructure is a model for the larger sphere of social/cultural activities (beyond those relevant simply to the community) in which members of the community imparts to the outside world during a certain time span" (Chang 1968 : 6-7). By taking inferences from the works of archaeologists, ethnographers, geographers, and historians, Trigger (1968) suggested that settlement studies can be more profitably done if we study them in the terms of following three levels :

1. Individual building or structure

2. The manner in which these buildings or structures are arranged within a single community

3. The manner in which communities are distributed over the landscape.

Trigger (1978 : 169) states that "each of these levels appears to be shaped by factors that differ in kind or degree from the factors that shape other levels; hence the combined study of all three is likely to shed more light on archaeological cultures than is the study of a single level". But under certain limitations and circumstances each level can be investigated in relative isolation. Trigger has given a detailed analysis of various factors affecting each level of settlement pattern. These are briefly summarised below.

Individual Building : The individual structures are affected by several factors. The subsistence regime of the society affects the structures e.g. migratory people tend to have houses which are transportable or easy to build whereas sedentary people will have permanent houses. The houses also represent an attempt to meet the challenge of an environment with the building material that the same environment offers. The principal climatic factors to which houses adapt are the diurnal and yearly variations in ambient and radiant temperatures, air movement and humidity. These adaptations are mainly reflected in the shapes, sizes, construction material etc. The buildings also reflect the skill of their builders and their technology. This technological know-how reflects the range of material that are available, and through the materials the shape and designs of buildings. The size and layout of the building may reflect the structure of family (Chang 1958, Murdock 1934). The forms of houses may be related to the forms of family organisation (Codrington 1957). The structure may also reflect differences in wealth and rank, as well as various social institutions (Trigger 1963, Dhavalikar 1977). The specialization of production is also reflected in the individual structure, in the form of either a workshop added on to the house or a separate building that serves as a workshop and storeroom.

A general review of ethnographic literature suggests a correlation between circular houses and temporary settlements and between rectangular houses and sedentary occupation (Robbins 1966, Flannery 1972). Cross-cultural data from

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HARF files were subjected to statistical tests which showed a significant relationship between sedentary, agricultural population and rectangular house plan and between relatively mobile, essentially non-agricultural groups and circular house plans (Parson 1972). Archaeological records also indicate a shift from round to rectangular dwellings accompanying the transition to a more fully agricultural subsistence (Flannery 1972).

Community Pattern

The next level is the layout of the structures constituting a single community. The size and stability of a community quite obviously, are limited by the environment and the effectiveness of subsistence technology. The latter includes the means of acquiring or producing food as well as storing, processing and transporting it. The last three factors often are crucially important : effective means of storing food allows the population to expand beyond the numbers that could survive the period of least production, processing allows food to be used that otherwise would be inedible, and the transportation determines the size of the area over which food can be collected and concentrated. The ecological factors play an important role in determining the major types of community pattern. Within any region, people will tend to settle down in places that are close to drinking water, sources of food, and, as far as possible, that are safe and pleasant[1].

While the community size and locations are influenced to a large extent by ecological factors, the layout of communities appears to be strongly influenced by family and kinship organisation—specially in primitive societies (Steward 1955, Chang 1962). In complex societies, besides kinship, social classes, religion and ethnic groups also determine the settlement pattern of a community. In a more complex society subsistence factors in the narrow sense, are not so important in determining the size and location of settlements. Trade may provide a source of wealth and stimulate the growth of large cities in remote regions, and the wealth amassed from such trade in turn may either finance a novel agricultural system in an area where they would otherwise be impractical or affect the importation of food from distant regions. Settlements may also spring up in wastelands where rare and valuable minerals are discovered. In ancient times, copper smelters were built at Aquba on the shores of Red Sea, a region rich in copper but lacking in agricultural potential.

Specialization on a local or village level can develop in relatively simple societies. When a number of villages are linked together in a trading network, they can transcend local limitations on natural resources. The development of complex political organisation gives rise to similarly specialized communities. Isolated forts and garrison towns are built to guard frontiers or police the countryside whereas royal courts are built within the cities, but they constitute independent communities. Warfare and defence play important roles in deter-

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mining the location of sites and layout of communities. Where warfare is endemic, villages commonly are built on hilltops or at the bend of the rivers.

The studies at this level are fairly numerous. Examples would include the works of Adams (1968), Bros (1970), Clark (1952), Dhavalikar (1977), Flannery (1972, 1976), Fletcher (1979), Haviland (1970), Hill (1966, 1970) and Longacre (1964, 1968).

Zonal Pattern

Overall density or distribution of population of a region is determined to a large degree by the nature and availability of natural resources that are being exploited. As long as areas with good soil, other economic resources and favourable climate are available, settlers tend to avoid areas that are naturally poor or where diseases or other dangers are common. Factors such as availability of game have a strong bearing on the size of hunting territories and on the distribution of permanent transit bases. The attraction of fishing and the difficulties of overland travel through bush or jungle may result in concentration of population along the open spaces beside water. The agricultural communities tend to settle on fertile land close to rivers. In complex societies fertile regions became centres of population aggregation and hence of political and cultural importance.

The overall distribution of settlements is also affected by political organisation. Internal security may require garrisons or administrative towns in various sections of the country. In a centrally organised state, towns with the emperor's representatives and administrative staff form the provincial nuclei within a milieu of villages and scattered home steads. The national capital would be characterised by its greater size and luxury. In civilizations where cities are less important, the distribution of shrines or ceremonial centres likewise may reflect political organisation. War is another factor that shapes overall distribution of settlements. Scattered communities may join together to build a common fort to which they can flee at the time of trouble. Where population density is low, the different groups may be separated from one another by lakes, or broad stretches of forests which may be termed as buffer zone between belligerent factions. In large states the defence system may become an important feature of the settlement pattern.

Religious factors also affect settlement pattern. For example, in the Maya civilization ceremonial centres served as community or state *foci* for the population that lived around them.

Some important studies at the zonal level are those of Adams (1961, 1965), Bullard (1960), Childe (1934), Chitalwala (1979), Clarke (1972), Coe and Flannery (1967), Davidson (1972), Dhavalikar (1978), Fitting (1969), Flannery (1976), Flemming (1971), Fox (1932), Jones (1960, 1961), Lal (1978, 1981), Martesen (1972), Parson (1971), Possehl (1980), Renfrew (1972), Sanders (1965), Soudsky

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and Pavlu (1972), Suraj Bhan (1977), Trigger (1995), Willey *et al.* (1965), and Winters (1967, 1969).

So far we have been considering settlement patterns as a reflection of a variety of more or less stable conditions. There are still factors like migration and population changes which may look causal in the effect but sometimes they after the settlement pattern of a region more or less completely. Homans (1962 : 127-28) has argued that two contrasting types of settlements in medieval England, the compact villages of the central region and the dispersed settlements of Kent and Anglia were the result not of geographical and technological variations but of different traditions of land use that were brought from the continent. The rise and fall of population in response to economic factors or disease may also affect the settlement pattern in various ways.

Thus, it is clear that settlement patterns are influenced by a number of different factors in different ways and degrees at different levels. "If we conceive of the settlement pattern as an outcome of the adjustments a society makes to a series of determinants that vary both in importance and in the kinds of demand they make on the society, we must consider not merely the range of factors affecting settlement patterns but also the manner in which different factors interact with one another to produce a particular pattern. Factors vary in importance according to both the local situation and the temporal relationship they have to one another" (Trigger 1978 : 189). The settlements and settlement patterns have never been static. Their interrelated determinants and components are in a state of continual change—changes in their ecological conditions, their technology, material culture, economy, social organisation and political relationships. The changes sometimes may be so minute as to be indiscernible either to the living population or in the archaeological data. Or the changes may be obvious and swift, in which case it may be clear to modern observers or felt by the community in question and may be reflected in an equally clear modification of settlement or settlement pattern (Tringham 1972 : XXIV).

Scope of the Present Chapter

In the present chapter Trigger's third level of settlement pattern studies i.e. *zonal pattern* has been studied. His first and second levels are not possible to study because hardly any detailed data on internal structures of villages is available. Also at the present stage of our knowledge we cannot attempt to trace social connections which may have bound certain hamlets and villages to each other. Though, some areas of the settlement system have been explored, the main concentration is on the ecological and demographic aspects of cultures.

The main body of data for this chapter comes from my own field research in Kanpur district, though wherever relevant and useful, earlier published data have also been utilized.

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In chapter IV the limits of the duration of each cultural period have been given. The total time period of a culture, however, is not relevant in the estimation of area occupied or population of that culture. This is so because we are estimating the area and population on the basis of the total number of sites known for a culture. This number would naturally have been reached quite sometime after the initial appearance of the culture. It is assumed that the maximum area occupied by a culture and the peak of the population of that culture must have occurred towards the very end of period of the concerned culture. This assumption will not be valid where there is a definite evidence of the decline of a culture and desertion of its settlements as for example in the case of the Indus civilization. But in the case of the protohistoric and early historic cultures of the Ganga valley there is no evidence that during any of the cultural periods any appreciable number of sites were deserted. In fact we find newer culture on all the sites of the latter.

The period suggested for maximum occupation and population during successive cultures are as follows :

1. For the BRW period 1350 B.C. has been considered because 1300 B.C. is the lower date limit of the PGW.
2. In the case of the PGW the climax period is considered to be between 800 and 750 B.C. because the upper date limit of the PGW is 600 B.C. and around 700 B.C. the NBPW is introduced in the area. Also it is in the late levels of the PGW that we find maximum use of iron and prevalence of architectural activities.
3. For the NBPW the period between 300 and 200 B.C. has been considered because we find large scale use of coins, massive structural activity and development in the field of art and other cultural aspects during this period.
4. For the Early Historic period 150-200 A.D. has been considered as the climax period because historical writings clearly show that at this time the culture was at the peak and it had started declining after the fall of the Kushanas.

Limitations

There are several limitations to the reconstruction of the settlement pattern in the present study. Here I shall discuss only the limitations of general nature as the limitations of each period have been discussed in these respective sections.

First of all the total number of sites. It is rather difficult to say with any degree of certainty that the total number of sites discovered is exactly the same that were occupied during different periods. Quite a number of sites on the river

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banks might have got totally eroded due to changing river courses. Sites with a thin habitation deposit often get levelled into agricultural fields, and after the lapse of some time all surface indications are lost. Some sites may have got buried under the sprawling city of Kanpur. Further, the possibility of a few sites remaining unexplored cannot be ruled out.

The size of sites during different cultural periods has been decided only on the basis of the distribution area of distinctive ceramic types. With this criterion we can be sure only of the terminal period of habitation. Surface exploration allows no firm check on the area of occupation of a site prior to the terminal stage. Thus it remains a presumption that the area covered by ceramic types represents the actual area occupied. Adams (1965 : 121-24) in his study of the Diyala Plains assumed the area of occupation during the terminal period as the representative area for all the periods represented on the site. Adams feels that the assumption that early areas of habitation equalled maximal (or even aggregate) areas of later settlements must tend systematically to increase an estimate of the former, and thus compensate for the percentage of loss the sites may have suffered through erosion, alluviation as also for undiscovered sites.

The data from surface collection allow us to presume that individual villages and towns in an area were occupied contemporaneously and not subsequently within a broad period of several centuries. This fails to take into account the possibility that at least a few sites were occupied subsequently or some abandoned earlier than others. Thus insufficient chronological control makes it impossible to distinguish the periods beyond different cultural levels. Our settlement pattern and settlement system study for each period is a composite of all occupational activities over the period of 4-6 centuries and thus it becomes almost impossible to adequately deal with such crucial problems as site contemporaneity and the branching out of communities from parent settlements.

It is also difficult to determine whether a site was temporarily or permanently occupied. Similarly the thickness of deposit is also not a very reliable indicator of the duration of site occupation. As Chang (1972 : 10) says "a pile of industrial waste accumulated by ten flint knappers in one day or a pile accumulatad by one flint knapper in ten days would be difficult, if not impossible to determine".

Another problem arises in inferring the strategies adopted by protohistoric and early historic settlers from present land use patterns. It has been argued (Flannery 1972) that changes in local environment (e.g. deforestation, erosion and lowering of the water table) over hundreds or thousands of years may negate the use of modern land use pattern in the analysis of site territories, exploitation etc.

These limitations and others to be mentioned in different sections may give a depressing feeling, but we have to put up with them. The archaeologists

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have to "learn to live with the realization that their desire to study whole cultural systems cannot be realized. Much of the weakness of modern archaeology results from a tendency among archaeologists to treat their discipline as being merely the 'past tense of ethnology' or a kind of 'palaeoanthropology' rather than defining its goal in terms of potentialities of its data" (Trigger 1978 : 151). Any simulation, substitution, reproduction or visualization of past landscape or reality which we cannot directly observe and about which empirical data are not and could not be ordinarily adequate, is affected by current or contemporaneous sense—perception and value systems which are themselves dynamic and change with time and space.

Size and Distribution of Settlement

This section deals with the distribution pattern of sites in general and in respect of their size. The pattern of distribution has been seen in the context of ecology. It has been explained that how the different ecological factors in two zones—Ganga-Rind doab and Yamuna-Rind doab—have affected the pattern of settlements in various ways. For example in one area they have been a stimulant to the growth of settlements both in number and size and in the other area a constraint to growth and expansion of settlements.

The earliest culture identified in the area is BRW. The total number of BRW sites in Kanpur is nine, of which six are in the Ganga-Rind (G-R) doab and three in the Yamuna-Rind (Y-R), doab. All the sites are located on river banks. Of the six sites in the G-R doab, five are on the bank of the Ganga and one on the N. Non. The three sites in the Y-R doab are located one each on the Yamuna, the Sengur and the Rind (Fig. 23).

In respect of size, two of them are below 1 hect., four between 1 and 1.99 hect. and three above 3 hect. Of the below 1 hect. sites, there is one in each doab. Of the 1-1.99 hect. sites, three are in the G-R doab and one in the Y-R doab. Of the 3-3.99 hect. sites, there is one in each doab. The only site above 4 hect. is in the G-R doab.

The total number of PGW sites is 46 of which 31 are located in the G-R doab and 15 in the Y-R doab. All except six sites are located on river banks (Fig. 24). Of the 39 sites which are on river banks 26 are located on the right bank and 13 on the left. Fourteen sites are on the Ganga, all of them on the right bank. There are three sites on the Pandu, two on the right bank and one on the left. There is one site each on the Isan and N. Non, in both cases located on the right bank. Fifteen sites are on the Rind, six on the right bank and nine on the left. On the Sengur there are five sites of which three are on the right bank and two on the left. On the Yamuna there is only one site and it is located on the left bank. All the sites located on rivers are on elevated land and are away from the reach of floods. In the case of the Ganga the elevated land is

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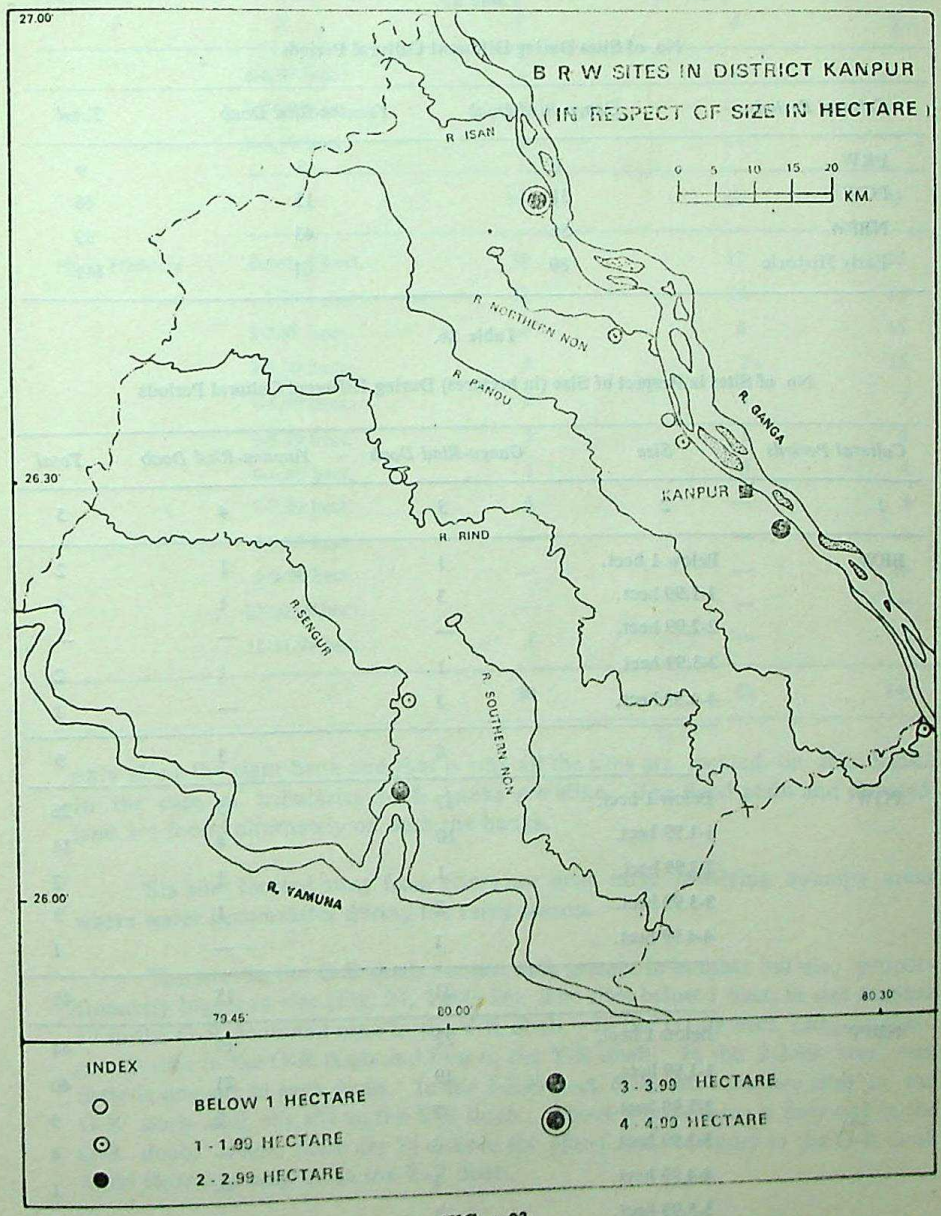

FIG. : 23.

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Table 25.

No. of Sites During Different Cultural Periods

Cultural Periods	*Ganga-Rlnd Doab*	*Yamuna-Rind Doab*	*Total*
BRW	6	3	9
PGW	31	15	46
NBPW	56	43	99
Early Historic	80	61	141

Table 26.

No. of Sites in Respect of Size (in hectares) During Different Cultural Periods

Cultural Periods	*Size*	*Ganga-Rind Doab*	*Yamuna-Rind Doab*	*Total*
1	*2*	*3*	*4*	*5*
BRW	Below 1 hect.	1	1	2
	1-1.99 hect.	3	1	4
	2-2.99 hect.	—	—	—
	3-3.99 hect.	1	1	2
	4-4.99 hect.	1	—	1
		6	3	9
PGW	Below 1 hect.	17	9	26
	1-1.99 hect.	10	4	14
	2-2.99 hect.	1	1	2
	3-3.99 hect.	2	1	3
	4-4.99 hect.	1	—	1
		31	15	46
NBPW	Below 1 hect.	22	19	41
	1-1.99 hect.	19	21	40
	2-2.99 hect.	7	2	9
	3-3.99 hect.	4	—	4
	4-4.99 hect.	1	—	1
	5-5.99 hect.	2	1	3

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1	2	3	4	5
	6-6.99 hect.	—	—	—
	7-7.99 hect.	—	—	—
	8-8.99 hect.	1	—	1
		56	43	99
Early Historic	Below 1 hect.	19	17	36
	1-1.99 hect.	31	24	55
	2-2.99 hect.	8	8	16
	3-3.99 hect.	8	7	15
	4-4.99 hect.	6	1	7
	5-5.99 hect.	3	1	4
	6-6.99 hect.	1	3	4
	7-7.99 hect.	3	—	3
	8-8.99 hect.	—	—	—
	9-9.99 hect.	—	—	—
	10-10.99 hect.	—	—	—
	11-11.99 hect.	1	—	1
		80	61	141

only along the right bank and that is why all the sites are located on this bank. In the case of tributaries both banks are alike. The flood-plain and elevated land are found alternately on both the banks.

Six sites located away from rivers are near large low-lying swampy areas where water accumulates during the rainy season.

The sites in the G-R doab are not only greater in number but also proportionately bigger in size (Fig. 24, Table 26). The sites below 1 hect. in size number 17 in the G-R doab and nine in the Y-R doab. In the 1-1.99 hect. category there are 10 sites in the G-R doab and four in the Y-R doab. In the 2-2.99 hect. size there is one site in each doab. In the 3-3.99 hect. class there are two sites in the G-R doab and one site in the Y-R doab. Above 4 hect. there is only one in the G-R doab. Thus, there are 14 sites in the plus-1 hect. category in the G-R doab while there are only six in the Y-R doab.

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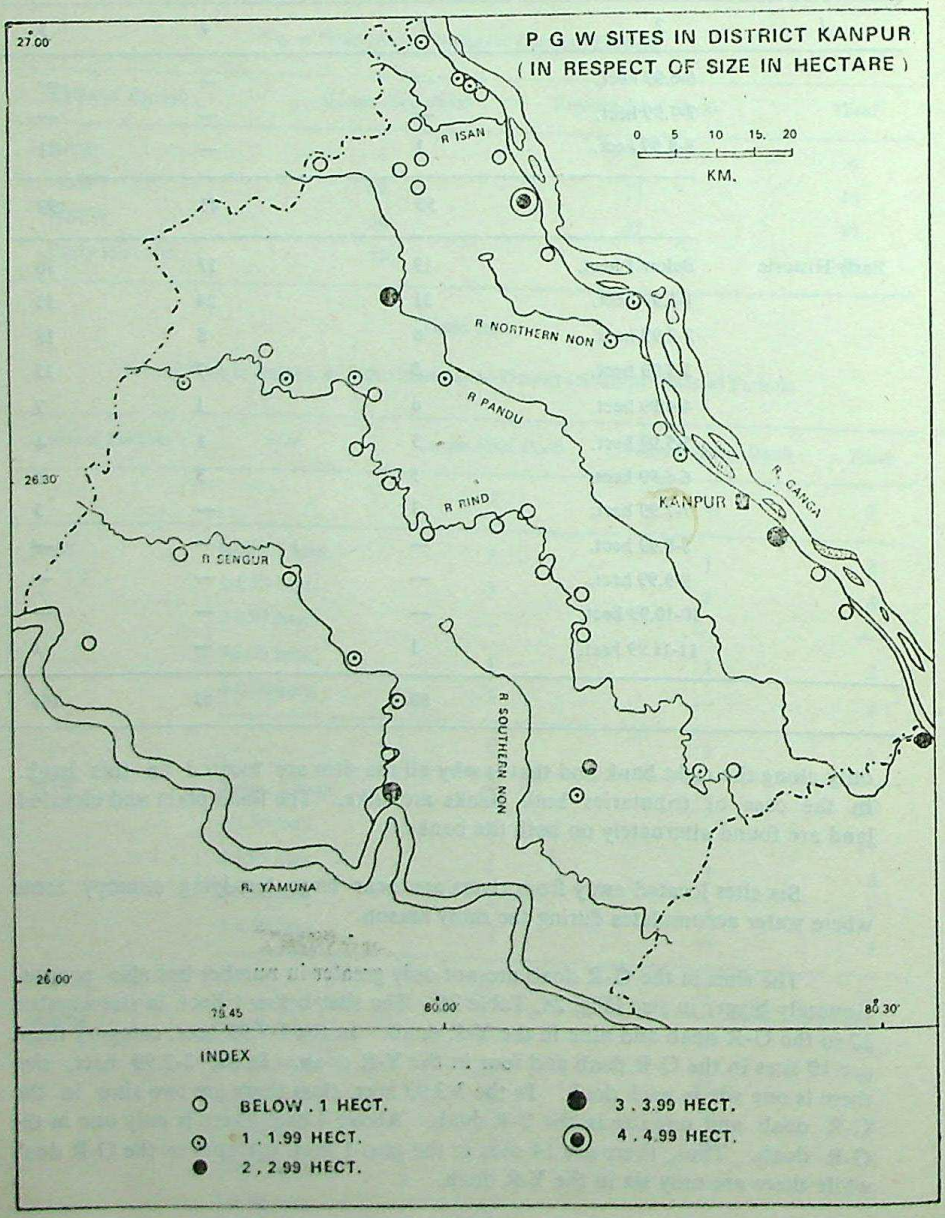

FIG. : 24.

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Table 27.

Total No. of Sites and Area Occupied by Each Category of Site (in respect of size in hect.)

Cultural Periods	Size of sites	Ganga-Rind Doab		Yamuna-Rind Doab		Total	
		No. of sites	Area occupied	No. of sites	Area occupied	No. of sites	Area occupied
1	2	3	4	5	6	7	8
BRW	Below 1 hect.	1	0.9	1	0.75	2	1.65
	1-1.99 hect.	3	4.00	1	1.5	4	5.5
	2-2.99 hect.	—	—	—	—	—	—
	3-3.99 hect.	1	3.00	1	3.00	2	6.00
	4-4.99 hect.	1	4.00	—	—	1	4.00
	Total	6	11.90	3	5.25	9	17.15
PGW	Below 1 hect.	17	10.53	9	5.83	26	16.36
	1-1.99 hect.	10	14.34	4	5.00	14	19.34
	2-2.99 hect.	1	2.62	1	2.25	2	4.88
	3-3.99 hect.	2	6.00	1	3.00	3	9.00
	4-4.99 hect.	1	4.00	—	—	1	4.00
	Total	31	37.5	15	16.08	46	53.58
NBPW	Below 1 hect.	22	12.53	19	12.24	41	24.77
	1-1.99 hect.	19	24.77	21	29.71	40	54.49
	2-2.99 hect.	7	16.54	2	4.50	9	21.04
	3-3.99 hect.	4	12.00	—	—	4	12.00
	4-4.99 hect.	1	4.00	—	—	1	4.00
	5-5.99 hect.	2	10.00	1	5.00	3	15.00
	6-6.99 hect.	—	—	—	—	—	—
	7-7.99 hect.	—	—	—	—	—	—
	8-8.99 hect.	1	8.75	—	—	1	8.75
	Total	56	88.59	43	51.45	99	140.05
Early Historic	Below 1 hect.	19	11.20	17	11.56	36	22.77
	1-1.99 hect.	31	42.77	24	31.46	55	74.23

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1	2	3	4	5	6	7	8
	2-2.99 hect.	8	19.49	8	18.93	16	38.43
	3-3.99 hect.	8	26.71	7	21.92	15	48.63
	4-4.99 hect.	6	26.84	1	4.00	7	30.85
	5-5.99 hect.	3	15.49	1	5.00	4	20.49
	6-6.99 hect.	1	6.00	3	18.00	4	24.00
	7-7.99 hect.	3	21.5	—	—	3	21.5
	8-8.99 hect.	—	—	—	—	—	—
	9-9.99 hect.	—	—	—	—	—	—
	10-10.99 hect.	—	—	—	—	—	—
	11-11.99 hect.	1	11.25	—	—	1	11.25
	Total	80	181.27	61	110.88	141	292.15

Table 28.

Mean Settlement Size (in hectares) During Different Cultural Periods

Cultural Period	*Ganga-Rind Doab*	*Yamuna-Rind Doab*	*Total*
BRW	1.98	1.75	1.86
PGW	1.21	1.07	1.16
NBPW	1.58	1.2	1.41
Early Historic	2.27	1.81	2.07

The pattern of site development shows that a majority of the settlements were small in size. Of the 46 settlements 40 remained below 2 hect. size and only six could grow to 2 hect., or more, in size. The total floor area occupied during this period was 53.58 hect. Of this, 37.5 hect. was in the G-R doab and 16.08 hect. in the Y-R doab (Table 27). The mean size of the settlements in the G-R doab is 1.21 hect. while in the Y-R doab it is 1.07 hect. (Table 28). The mean size for Kanpur as a whole is 1.16 hect.

One remarkable feature in the size and distribution pattern of sites is that sites away from rivers are smaller, in comparison to sites along the river-sides.

Of the NBPW period there are 99 sites. Of these 65 are located along river banks and 39 away from rivers. Again the sites in the G-R doab (56) are greater in number than in the Y-R doab (43). In the G-R doab 39 sites are on river banks while 17 are away from rivers. In the Y-R doab 27 are on river banks

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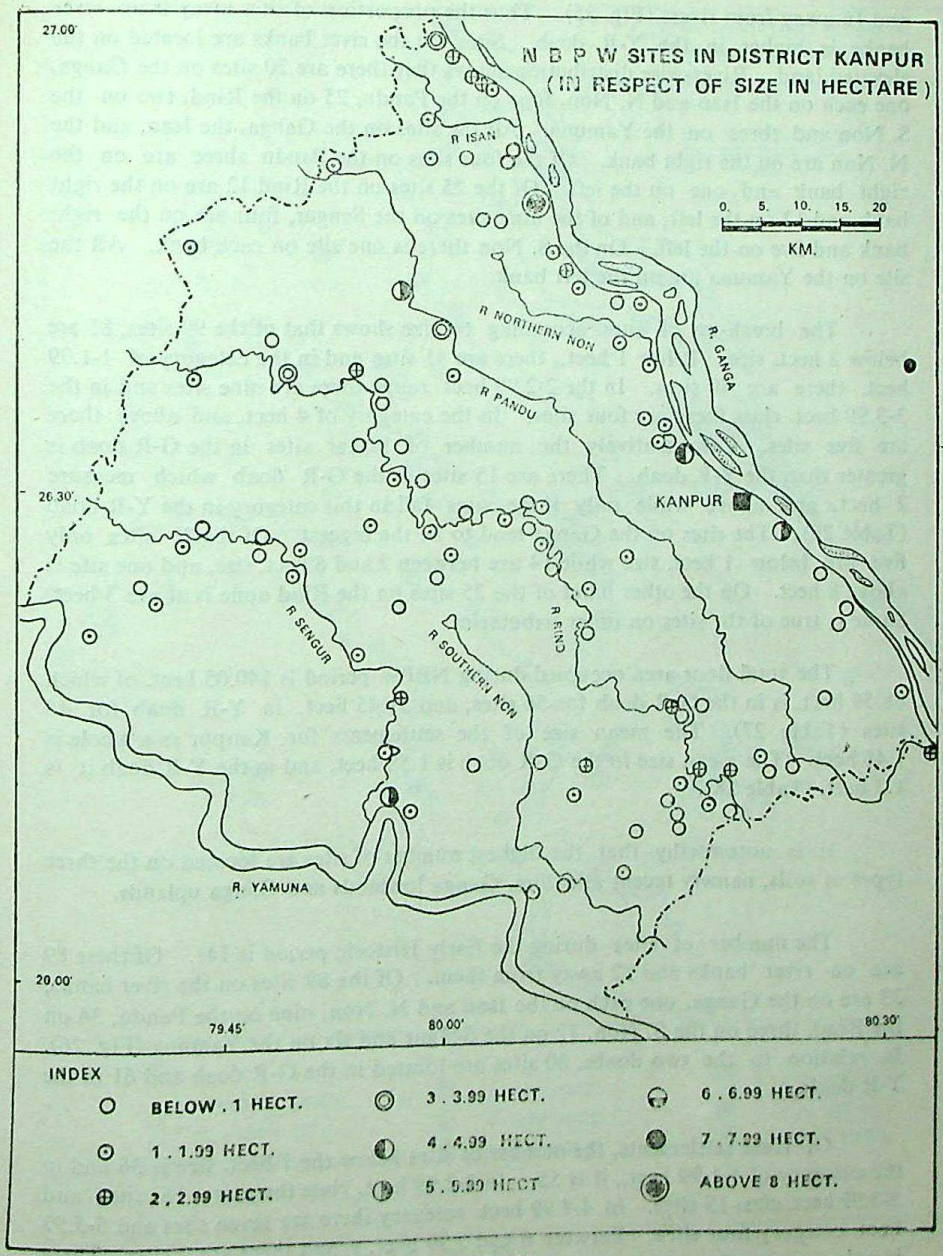

FIG. : 25.

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and 16 away from rivers (Fig. 25). Thus the proportion of sites away from river banks is higher in the Y-R doab. Sites on the river banks are located on the elevated land. River-wise distribution shows that there are 20 sites on the Ganga, one each on the Isan and N. Non, four on the Pandu, 25 on the Rind, two on the S. Non and three on the Yamuna. All the sites on the Ganga, the Isan, and the N. Non are on the right bank. Of the four sites on the Pandu three are on the right bank and one on the left. Of the 25 sites on the Rind 12 are on the right bank and 13 on the left, and of the nine sites on the Sengur, four are on the right bank and five on the left. On the S. Non there is one site on each bank. All the site on the Yamuna are on the left bank.

The break-up of sites according to size shows that of the 99 sites, 81 are below 2 hect. size. Below 1 hect., there are 41 sites and in the category of 1-1.99 hect. there are 40 sites. In the 2-2.99 hect. range there are nine sites and in the 3-3.99 hect. class there are four sites. In the category of 4 hect. and above there are five sites. Comparatively the number of bigger sites in the G-R doab is greater than the Y-R doab. There are 15 sites in the G-R doab which measure 2 hect. and above while only three sites fall in this category in the Y-R doab (Table 26). The sites on the Ganga tend to be the biggest. Of the 20 sites only five are below 1 hect. size while 14 are between 2 and 6 hect. size, and one site is above 8 hect. On the other hand of the 25 sites on the Rind none is above 3 hect. Same is true of the sites on other tributaries.

The total floor area occupied during NBPW period is 140.05 hect. of which 88.59 hect. is in the G-R doab for 56 sites, and 51.45 hect. in Y-R doab for 43 sites (Table 27). The mean size of the settlements for Kanpur as a whole is 1.41 hect. The mean size in the G-R doab is 1.58 hect. and in the Y-R doab it is 1.2 hect. (Table 28).

It is noteworthy that the highest number of sites are located on the three types of soils, namely recent alluvium, Ganga lowlands and Ganga uplands.

The number of sites during the Early Historic period is 141. Of these 89 are on river banks and 52 away from them. Of the 89 sites on the river banks, 23 are on the Ganga, one each on the Isan and N. Non, nine on the Pandu, 34 on the Rind, three on the S. Non, 12 on the Sengur and six on the Yamuna (Fig. 26). In relation to the two doabs, 80 sites are located in the G-R doab and 61 in the Y-R doab.

Of these settlements, the number of sites below the 1 hect. size is 36 and in the category of 1-1.99 hect., it is 55. In 2-2.99 hect. class there are 16 sites and 3-3.99 hect. class 15 sites. In 4-4.99 hect. category there are seven sites and 5-5.99 hect. category four sites. Between 6 and 7.99 hect. group there are 7 sites. There is only one site above 11 hect. (Table 26).

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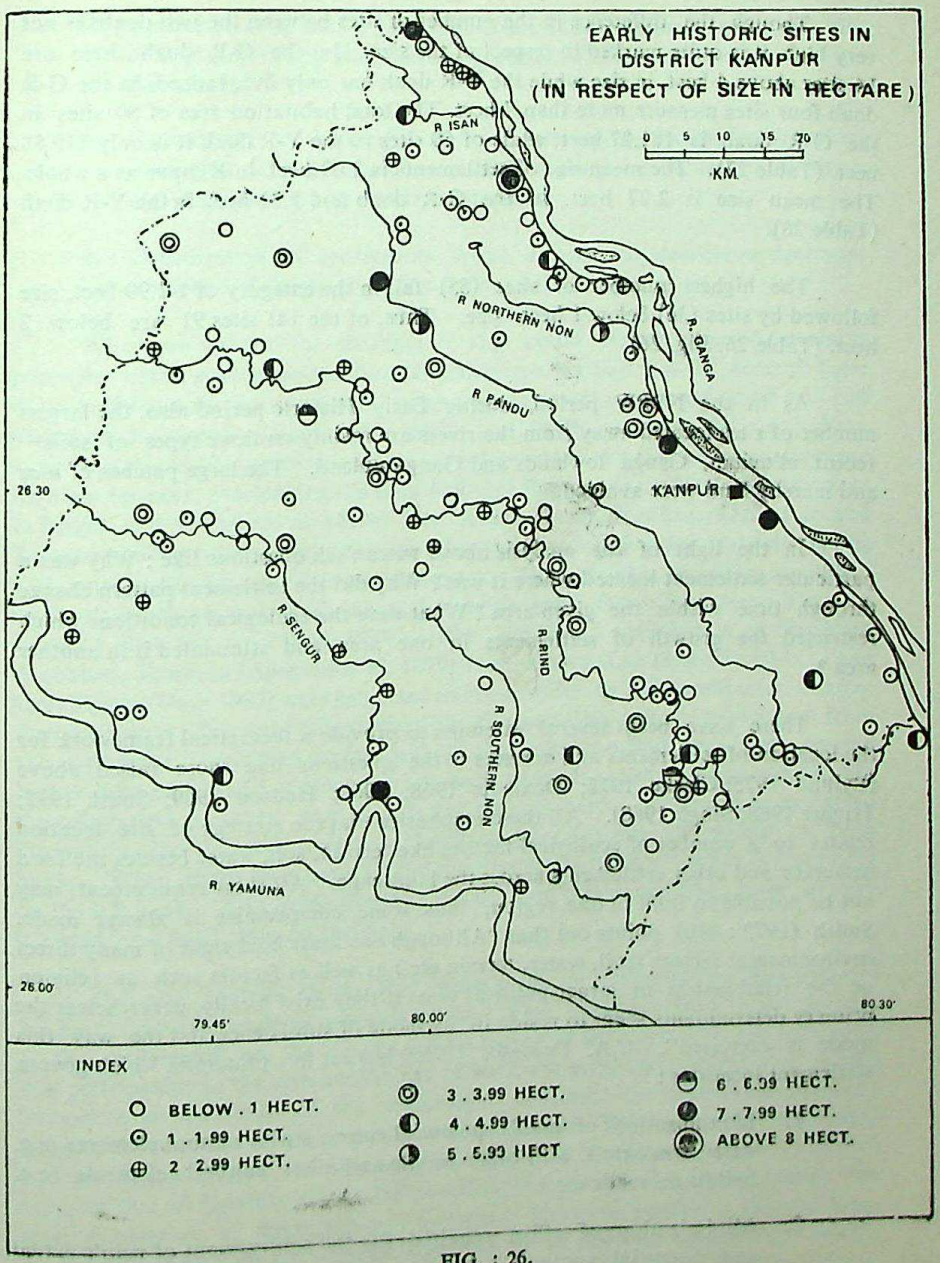

FIG, : 26.

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Though the difference in the number of sites between the two doabs is not very high, it is quite marked in respect of the size. In the G-R doab there are 14 sites above 4 hect. in size while the Y-R doab has only five. Indeed, In the G-R doab four sites measure more than 7 hect. The total habitation area of 80 sites in the G-R doab is 181.27 hect. while of 60 sites in the Y-R doab it is only 110.88 hect. (Table 27). The mean size of settlements is 2.07 hect. in Kanpur as a whole. The mean size is 2.27 hect. in the G-R doab and 1.81 hect. in the Y-R doab (Table 28).

The highest number of sites (55) fall in the category of 1-1.99 hect. size followed by sites (36) below 1 hect. size. Thus, of the 141 sites 91 are below 2 hect. (Table 26, Fig. 26).

As in the NBPW period, during Early Historic period also, the largest number of sites located away from the rivers are mainly on three types of soils—recent alluvium, Ganga lowlands and Ganga upland. The large patches of *usar* and marshy land were avoided.

In the light of the analysis above we can ask questions like : Why was a particular settlement located where it was? Why did the settlement pattern change through time within the given area ? What were the ecological conditions which restricted the growth of settlements in one area and stimulated it in another area ?

There have been several attempts to provide a theoretical framework for the location of settlements and answers to the questions like those raised above (Bylund 1975; Clarke 1976; Doxiadis 1968, 1969; Hudson 1969; Smith 1972; Trigger 1968; Singh 1968). All these emphasize that the strategy of site location relates to a number of ecological factors like terrain, soil, water besides the food resources and other settlements across the landscape. All these requirements may not be possible to fulfil in one region, thus some compromise is always made. Smith (1972 : 410) points out that "Although one must hold sight of many direct environmental factors (soil, water, terrain etc.) as well as factors such as religion or the relationship to larger political units if they exist locally, nevertheless the primary determinants seem to reside in the mode of subsistence and the way this mode is exercised". C.A. Doxiadis (1969) has set five principles which govern settlement locations :

1. Maximization of man's potential contac s with natural elements (e.g. water, trees etc.), with other people and other cultural elements (e.g. buildings, roads etc.).

2. Minimization of effort required for the achievement of man's actual and potential contacts according to the general principle of least effort.

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3. Optimization of man's protective space at every movement individually or in group, in any situation and locality, whether it is temporary or permanent.

4. Optimization of the quality of man's relationship with his environment consisting of nature, society, shells (buildings and houses of all sorts), and networks (lanes, streets, roads etc.).

5. Organisation of settlements in an attempt to achieve an optimum synthesis of the previous four principles.

When we search for the factors that could explain some of the above principles which govern the location of settlements, we find that in general there was a preference for the areas with better environmental conditions, good soil and economic resources. During the BRW and PGW periods rivers played an important role in the selection of sites. Settlements in the area of inundation are on high terraces, overlooking the river and vast flood-plains. These terraces vary in height and steepness at places like Ankin, Seng, Radhan, Durgapur and Jajmau, while at other places, they are often just a series of undulations alternating with more or less level patches of cultivation. These patches are often inundated by floods which provide fresh alluvial deposit good for cultivation. There is evidence that the OCP aud PGW (1800-1200 B.C.) settlements at Narsirpur Ambkheri, Jhinjtara (Agrawal et al. 1977) Hastinapura (Lal 1954-55 : 10-11), and Atranjikhera (Gaur 1967) were subjected to flooding during their occupation or after abandonment. The early colonisers of the Ganga valley seem to have learnt from this experience. This may explain why on the Ganga we find sites only on the higher right bank and not along the left bank which is mainly a flood-plain.[2] On the tributaries, however, sites are found on both banks. This can be explained through the fact that tributaries have levees and flood-plains alternately on both banks. When there is a levee on the right bank the flood-plain lies in front of it on the left bank. After some distance the position is reversed i.e. a levee on the left bank and flood plain on the right.

The size analysis shows that when a site on a tributary reaches a size of 2-3 hect. there is a tendency towards fission. They could not grow bigger in size as the settlements on the Ganga. This fission of settlements on the tributaries was perhaps due to the non-availability of sufficient good agricultural land in the immediate surroundings of the settlements. Further, the soils found along the tributaries are not as fertile as those along the Ganga. This would have demanded a longer fallow period for the soil to regain its fertility. Smith (1972 : 415) explains that settlements of long-fallow cultivations tend to be small, though the total population of the region may be large. The basic concept is that the long-fallow cultivation does not so much limit the size of the total population (within the limits of environments' carrying capacity) as it limits the size of local units. At the same time Smith holds that more intensive cultivation does not necessarily

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call for large and nucleated settlements. If the land tenure rules are changed under the conditions of high population density and competition for land, it may lead to dispersed homesteads. The presence of large nucleated settlements on the Ganga is probably due to the greater availability of good fertile cultivable land and shorter fallow periods.

The sparseness of settlements on the Yamuna and the Sengur can be partially explained by the *kankary* ravines, which extend 6 to 8 km. away from the banks. The soils along these rivers are most unpromising. Only at some places along the banks of Sengur we find a narrow strip of fresh alluvial land and near its confluence with the Yamuna there is a wide area of fresh alluvial deposit of high agricultural value. This factor explains the location of a few sites along the Sengur and of the site of Musanagar at its confluence with the Yamuna.

The sites which are away from rivers are located near large lowlying swampy areas (Fig. 27) which in the past must have been regular lakes. In the *Gazetteers* and *Census Reports* of the second half of the nineteenth and first half of the twentieth century the swampy areas near Jahangirabad, Auron, Uttah and Bhadras have been mentioned as lakes. The location of settlements beside these lakes must have been due to the availability of water and aquatic food from the lakes and soft alluvial soils around them. But in comparison to the riverside sites the habitation deposit is less thick, showing that the settlers realized the disadvantages of being away from the rivers and deserted the sites.

Thus, it can be inferred that the first and second stage of colonisation was confined to restricted areas of permanent cultivable soils associated with rivers and lakes.

A significant change in the distribution pattern of settlements took place during the succeeding periods i.e. NBPW and Early Historic. During these periods, settlements extended beyond the range of locations of the previous periods. A substantial number of sites are now found away from rivers and they are not always near lakes. This could be possible only because of the better technology available to the people in the form of cheap and plentiful supply of iron implements. An adequate availability of iron axes was helpful in clearing the dense forest which could not have been cleared with copper or early iron technology during the preceding cultural periods. During the NBPW and Early Historic periods a simple but effective ox-drawn plough was probably used. Perhaps it was very much like the one that is still widely used; it could hardly have been simpler and more basic. This modern plough has a wooden stock shod with an iron blade, and a handle which is a backward projection of the stock. The draught pole projects from this piece and it carries cross-beam, fixed with a wooden peg, to which two oxen are yoked. The iron blade which looks like a large and broad spear-head can readily be attached to and removed from the stock. We find a similar description in *Krisi Tantra* of Parasara, dated to about 12th century A. D,

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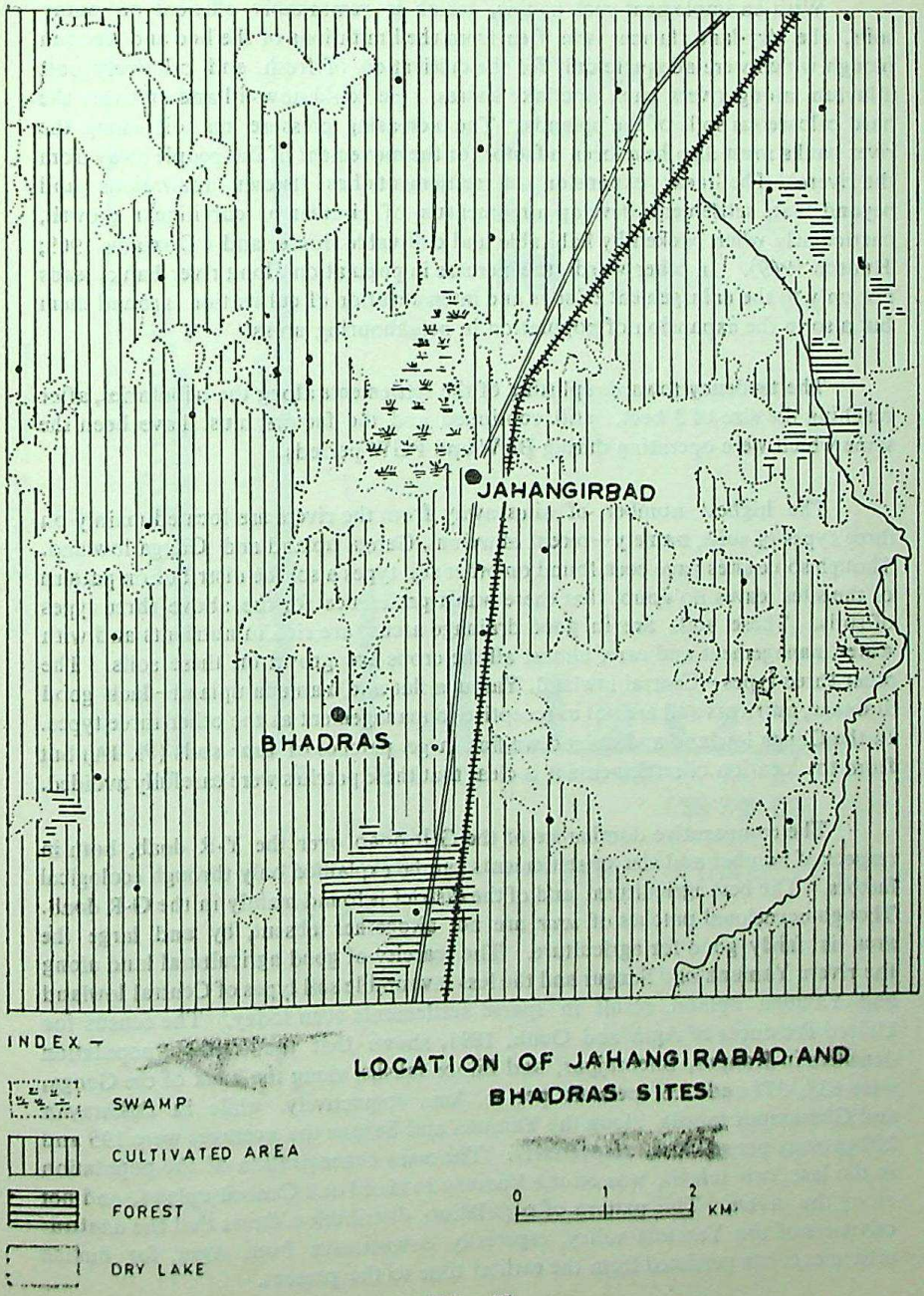

FIG. : 27.

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With an implement such as this, which is remarkably efficient on many soils, the dry-land farmer was free from the limitations of the hoe and wooden plough which were adequate only for the cultivation of fresh and relatively soft alluvium along rivers bank and lake shores. He could now till and cultivate the hard calcareous soils of the uplands. The increasing pressure on soil along the river banks must also have been a factor for the movement of the people away from the rivers. The linear expansion of settlements has its own limitations and beyond that, settlements develop a momentum of circular or curvilinear growth, particularly when backed by habitable and cultivable hinterland (Doxiadis 1969; Hudson 1969). In other words, the increase in population along river banks leads not only to the enlargement of sites and intensification of cultivation around them but also to the expansion of population in neighbouring areas.

The tendency towards splitting of the settlements along the tributaries, after reaching the size of 3 hect. still continued and the factors must have been the same which were operating during BRW and PGW periods.

The highest number of sites away from the rivers are located mainly on three types of soils, namely—recent alluvium, Ganga upland and Ganga lowland. Though some sites have been found on other soil types also, the distribution pattern of the sites leaves no doubt that there was a preference for the above three types of soils. These soils are in good drainage areas, are rich in nutrients and with water management and care, almost all the crops are grown on these soils. The other three types—Central lowland, Yamuna flat and Yamuna upland—lack good drainage, nutrients and are not as receptive to management as the other three types. In the Ganga lowland and upland we find large patches of *usar* soils (Pl. IA) but from the location of settlements it is clear that these patches were carefully avoided.

The comparative dominance of the G-R doab over the Y-R doab, both in respect of number and size of settlements can be explained only through ecological factors. The best agricultural land of the district is found mainly in the G-R doab. Though occasional patches of *usar* are not altogether absent, by and large the area is fairly good for agriculture. The scarcity of good agricultural land along the rivers Yamuna and Sengur and the less favourable soil types of Central lowland and Yamuna upland, result in sparse settlements even today. The census for United Provinces of Agra and Oudh, 1891, shows that the average population densities in Kanpur, Sheorajpur, and Bilhor tahsils, along the bank of the Ganga, were 635, 337 and 339 persons per sq. km., respectively, while in Pukhrayan and Ghatampur tahsils, along the Yamuna and Sengur the averages were 195 and 209 persons per sq. km., respectively. The main concentration of the population in the last two tahsils, was on the Yamuna lowland and Central upland, and not along the rivers. This pattern of population distribution shows that the unattractiveness of the Yamuna valley, especially downstream from Agra, for human settlements has persisted from the earliest time to the present.

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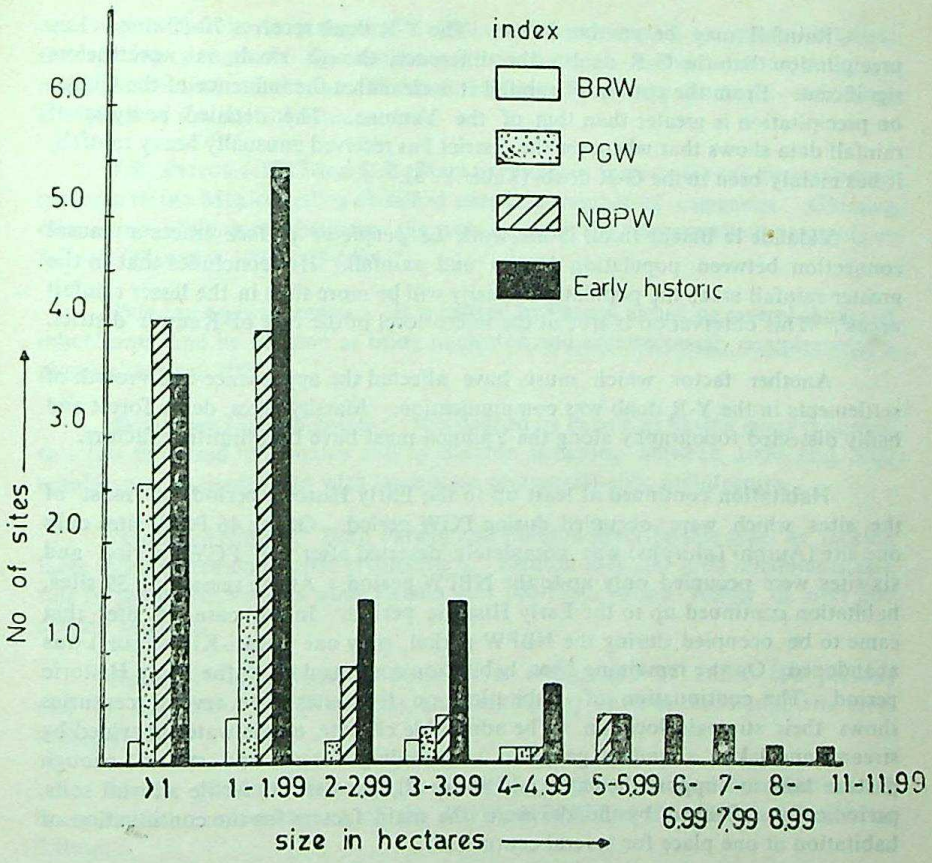

SETTLEMENT SIZE DURING DIFFERENT CULTURAL PERIODS IN KANPUR DISTRICT

FIG. : 28

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Rainfall may be another factor. The Y-R doab receives 70-80 mm. less precipitation than the G-R doab. the difference, though small, is nevertheless significant. From the pattern of rainfall it is clear that the influence of the Ganga on precipitation is greater than that of the Yamuna. The detailed analysis of rainfall data shows that whenever the district has received unusually heavy rainfall, it has mainly been in the G-R doab (Table V. 5).

Vidal de la Blache (n.d.) in his work *Le peuple de l' Inde* traces a causal connection between population density and rainfall. He concludes that in the greater rainfall areas the population density will be more than in the lesser rainfall areas[3]. This observation is true at the micro-level in the case of Kanpur district.

Another factor which must have affected the appearance and growth of settlements in the Y-R doab was communication. Marshy lakes, dense forest and badly dissected topography along the Yamuna must have been limiting factors.

Habitation continued at least up to the Early Historic period on most of the sites which were occupied during PGW period. Of the 46 PGW sites only one site (Auron-Tahirpur) was completely deserted after the PGW period and six sites were occupied only up to the NBPW period. At the remaining 39 sites, habitation continued up to the Early Historic period. In the case of sites that came to be occupied during the NBPW period, only one (Mati-Kishanpur) was abandoned. On the remaining sites, habitation continued up to the Early Historic period. The continuation of habitation on the sites for several centuries shows their strategic location. The admirable climate, ample water provided by streams and lakes, abundant game in surrounding forests and stream, enough pasture land to support the cattle and above all, permanent, fertile alluvial soils, periodically refreshed by floods, were the main factors for the continuation of habitation at one place for several centuries.

Size and Spacing of Settlements

In the previous section we have seen that there is a distinct relationship between ecological factors and the distribution of settlements of different sizes. If the rank-size rule—the number of settlements of a given type continue to increase as the size decreases—was to operate, then we should expect the spacing of settlements to be governed mainly by their size (Brush and Bracey 1955). Large settlements would be widely spaced and small settlements closely spaced. Christaller (1933) and Lasch (1954) put forward evidence that this proposition may be valid, at least for some areas.

The rank-size rule in the spacing of settlements operates only in the case of settlements of the same size (Haggett *et al.* 1977 : 128). However, as Thomas (1961) points out this does not necessarily mean that the populations of the sample settlement and the neighbour settlement are exactly of the same size; rather they

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are "approximately the same size". This would mean that if we want to estimate the spacing pattern of the settlements, we have to evolve a site typology, a classification that reflects the differences in size, function, structures and other attributes of the sites of same period.

J.R. Parson (1971) and R.E. Blanton (1972) in their studies of the settlement patterns in the Mexico valley classified sites in a number of categories. Glossing over some differences between the two authors, the relevant site typology is as follows (Flannery 1976 : 63-64) :

Primary regional centre : It is defined by Parson as having several thousand inhabitants, and by Blanton as being nucleated and architecturally complex with a population over 2000.

Secondary regional centre : It is defined by Parson as having many thousand to a few thousand inhabitants and by Blanton as having between 1000 and 2000 inhabitants, nucleated and with large-scale ceremonial-civic architecture.

Nucleated village : Both Parson and Blanton describe this type as lacking large scale ceremonial-civic architecture. Blanton uses 100-1000 inhabitants as a rule of thumb for villages while Parson uses 100-1500, with a village of over 500 classed as large.

Hamlet : It is defined by Parson as a community of under 100 persons and by Blanton of 10-100 persons, and lacking any obvious ceremonial and civic architecture.

In the present study I have adopted a slightly modified classification. I have divided the settlement of the PGW, NBPW and Early Historic period as follows :

	Number of Inhabitants		
	PGW	*NBPW*	*Early Historic*
Small village	below 500	below 500	below 500
Big village	500-750	500-1,000	500-1,000
Regional centre	750-5,000	1,000-5,000	1,000-5,000

When we classify settlements according to size (in terms of population or area) a hierarchical order emerges. Each level in the hierarchy is characterised by some distinctive features but the level also possesses all the features typical of the lower levels.

For the analysis of the spacing pattern, level 1, i.e. small village, would include all the settlements; level 2, i.e. big village, would include all the settlements

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having a population more than 500 and level 3, i.e. regional centre, all the sites having a population more than 750 in the case of PGW, and 1,000 in the case of the NBPW and Early Historic periods.

I would like to emphasize that the scope of the present section is comprehended within the terms of reference to spacing and by no means implies a geometrical pattern of the arrangement of settlements. Since the nature of spacing comprehended by a random cluster and a uniform cluster, and a uniform pattern is not included within the scope of the present section, the necessity of using the cumbersome nearest-neighbour method of Clark and Evans (1954) is automatically eliminated. The major focus of the study is on the regional pattern of spacing during different cultural periods.

The formula for determining the spacing of settlements is based on the density of rural settlements. The theoretical basis of the transformation of density into spacing is provided by an ultimate development of a polygon into a circle. A polygon is a geometrical figure that fits perfectly with another polygon without leaving any empty space. Thus the entire area can be conceived as a spatial structure built of a series of polygons, and the distance between the centres of the adjacent polygons would be the spacing of settlements which are assumed to be located at the centres themselves. To make the polygons fit with each other increasingly better, their sides would have to become more and more numerous. Ultimately, theoretically, the polygons would have an infinite number of sides, and the gradually decreasing length of their sides will be the chords of the circles fitting in exactly with their circumferences. In this way a polygon is transformed into a circle. Haggett (1965 : 48) also argues that in the continuum of regular polygons, the limiting case is clearly the circle which we may regard as a regular polygon with an infinite number of sides and vertices.

The formula used for the computation of spacing (S in km.) of settlements is as follows :

$$S=2\sqrt{\frac{A}{N\pi}}$$

Where A is the total area in sq. km. and N is the total number of settlements.

The derivation of formula is as follows :

The area around the settlement is assumed to be a circle. The area of the circle is the area curved within it from the total district area, hence,

$$\pi r^2=\frac{A}{N}$$

$$r^2=\frac{A}{N\pi}$$

$$r=\sqrt{\frac{A}{N\pi}}$$

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Since spacing between the adjacent centres of circles is the sum of their radii, it is equal to $2r$ and therefore spacing (S) is equal to $2r$ which is equal to

$$2\sqrt{\frac{A}{N}}$$

Spacing Pattern in Kanpur District

During the BRW period there were only nine settlements in the district. The average spacing between the settlements is 29 km. Because of the limited number of sites, ranking has not been attempted for the settlements of this period.

During the PGW period, of the 46 settlements 38 were small villages, four big villages and four regional centres (Fig. 29). The average spacing between two small villages was 13 km., big villages 31 km. and regional centres 45 km. (Table 30).

Table 29.

Number of Settlements of Different Categories in Kanpur District

Cultural Period	*Regional centre*	*Big village*	*Small village*
PGW	4	4	38
NBPW	5	16	78
Early Historic	19	38	84

Table 30.

Average Spacing (in km.) Between Settlements of Different Categories During Different Cultural Periods in Kanpur District

Cultural Period	*Regional centre*	*Big village*	*Small village*
PGW	45	31	13
NBPW	40	19	9
Early Historic	20	12	7.5

The average spacing pattern of small villages in Kanpur conforms well with the spacing pattern of PGW settlements in Rajasthan (Agrawal and Kumar 1976) and Meerut district in the Upper Ganga-Yamuna doab (Sharma 1972).

During the NBPW period of the 99 settlements 78 were small villages, 16 big villages and five regional centres (Fig. 30). The average spacing of small villages, big villages and regional centres was 9 km., 19 km. and 40 km., respectively, during this period as against 13, 31 and 45 km. respectively during the PGW

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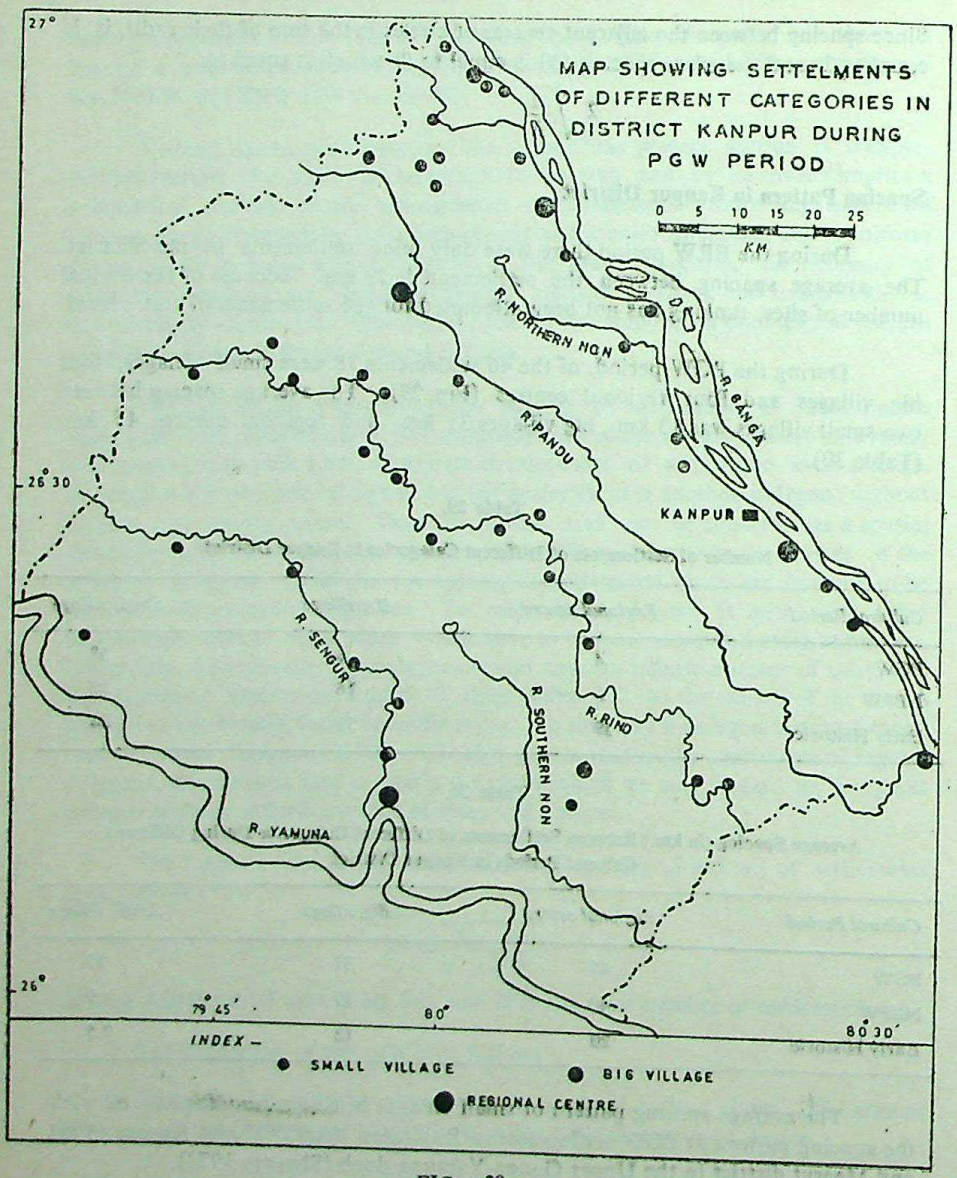

FIG. : 29.

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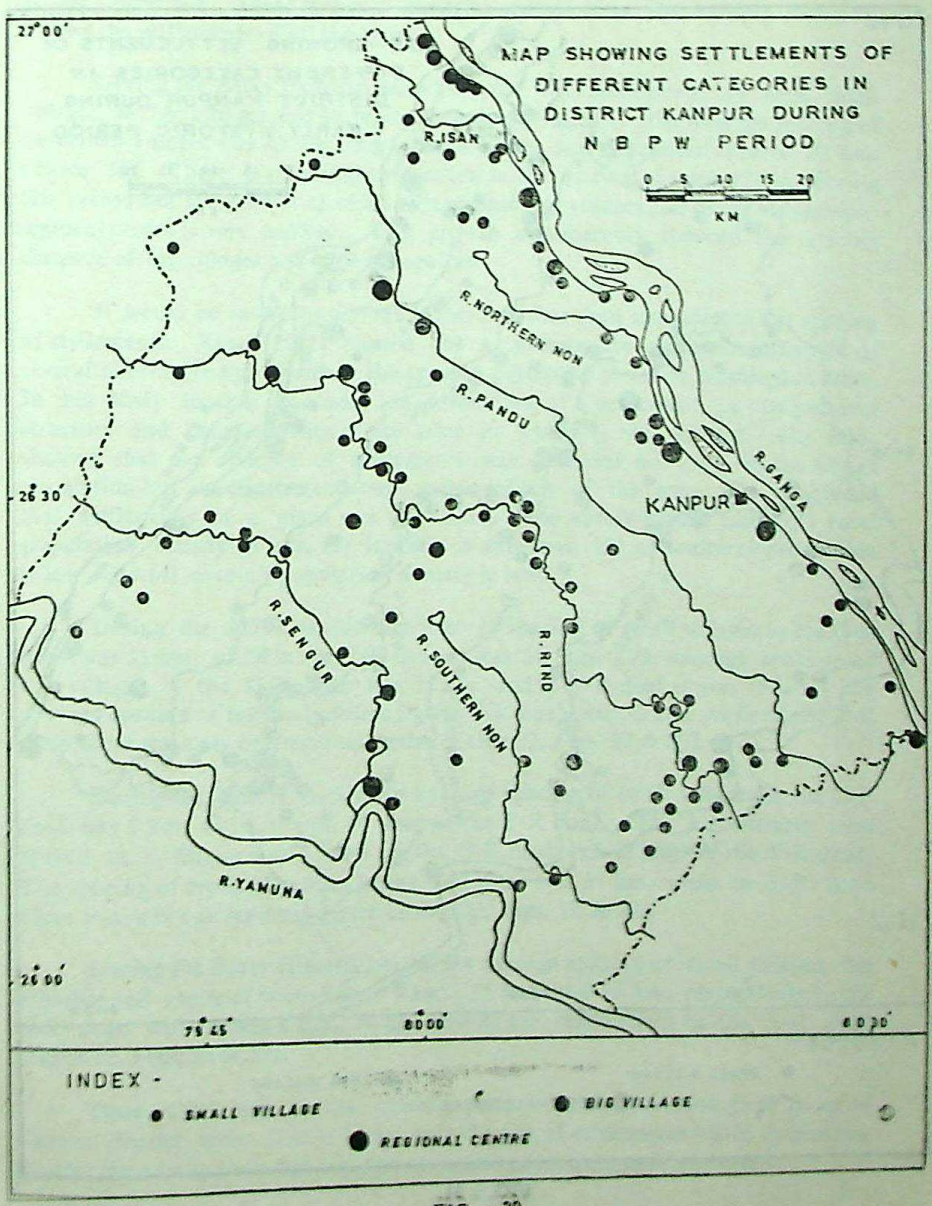

FIG. : 30.

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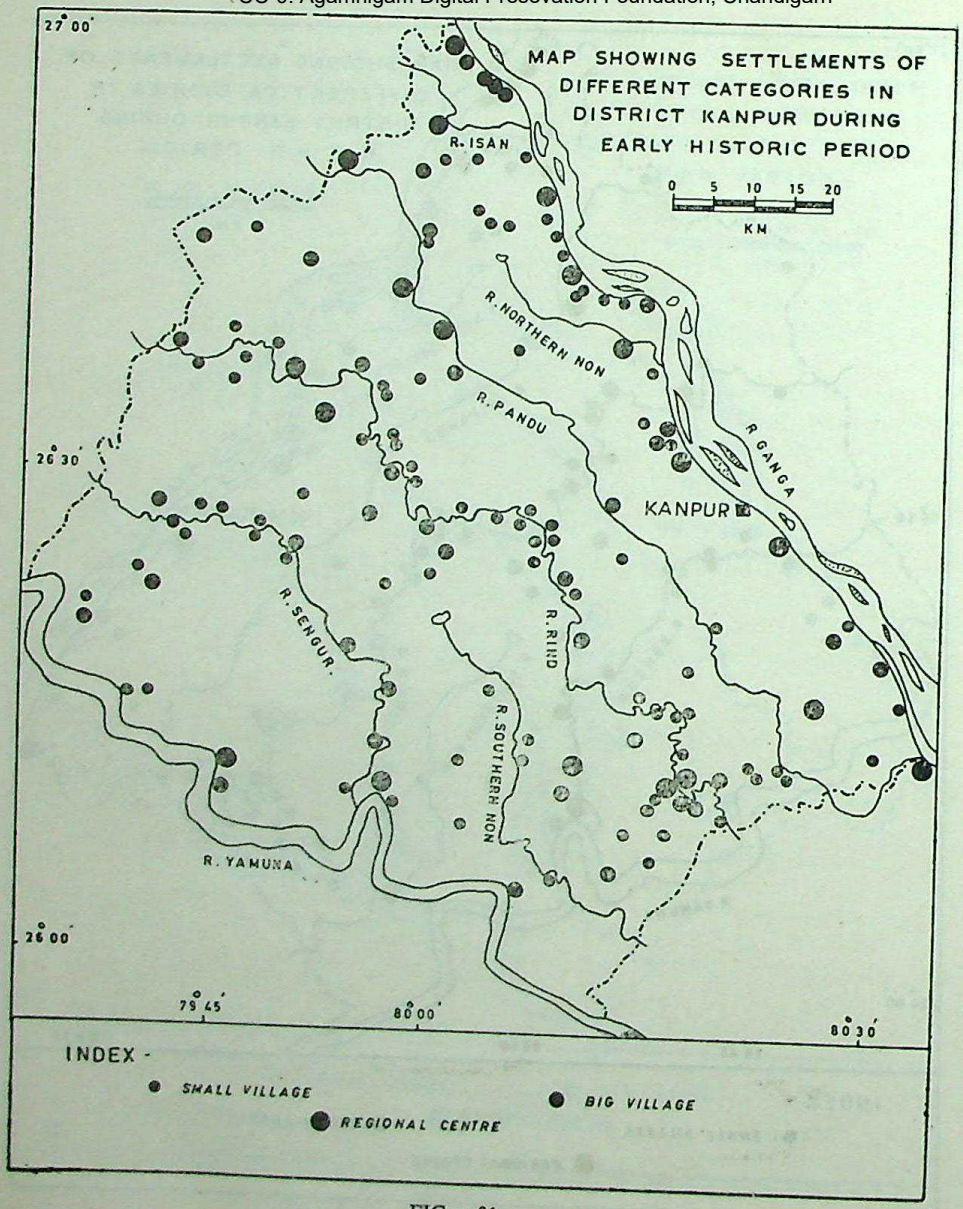

FIG. : 31.

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period (Table 30). There is thus a positive reduction in the spacing distances among the settlements of all the types.

During the Early Historic period, of the 141 settlements, 84 were small villages, 38 big villages and 19 regional centres (Fig. 31). The average spacing of two small villages was 7.5 km., big villages 12 km. and of regional centres 20 km. (Table 30). There is only slight reduction in the spacing of small villages during this period but the growth of small villages into big villages and of big villages into regional centre is very marked. This growth considerably reduced the spacing distance of big villages and regional centres.

It would be interesting to see if factors other than size affected the spacing of settlements. King (1961) carried out a multivariate regression analysis of several alternative hypotheses in the spacing pattern of towns in Washington State. In his study spacing was seen as a function of a settlement, its occupational structure and characteristics of the zone in which it was located. His study showed that the spacing of settlements was governed not only by the size of population but also by the economic potentialities of the area. He concluded that settlements of a given size were likely to be widely spaced where (1) rural population density is low, (2) farming is extensive, (3) agricultural production is low, and (4) over-all population density is low.

During the PGW period the average spacing of small villages in the G-R doab was 11 km. while in the Y-R doab it was 16 km. The average spacing of big villages in the G-R doab was 25 km. and in Y-R doab it was 45 km. The average spacing of regional centres in the G-R doab was 36 km. while in the Y-R doab there was only one regional centre (Table 32, Figs. 32 & 33).

During the NBPW period the average spacing of small villages in the G-R doab was 8 km. while it was 10 km. in the Y-R doab. The big villages were spaced at a distance of 15 km. in the G-R doab and 28 km. in the Y-R doab. The spacing of regional centres in the G-R doab was 31 km. while in Y-R doab there was only one regional centre (Table 32, Figs. 32 & 33).

During the Early Historic period the average spacing of small villages, big villages and regional centres was 7 km., 11 km. and 16 km. respectively in the G-R doab while it was 8 km., 14 km. and 28 km. respectively in the Y-R doab (Table 32, Figs. 32 & 33).

These differences in the spacing pattern in the two ecological zones of Kanpur district show that it is not only the size of settlements which determines the spacing among them but also the economic potentialities of the area.

The spacing pattern on the rivers is markedly different from that of the area taken as a whole. Here, I have taken into consideration only three rivers—

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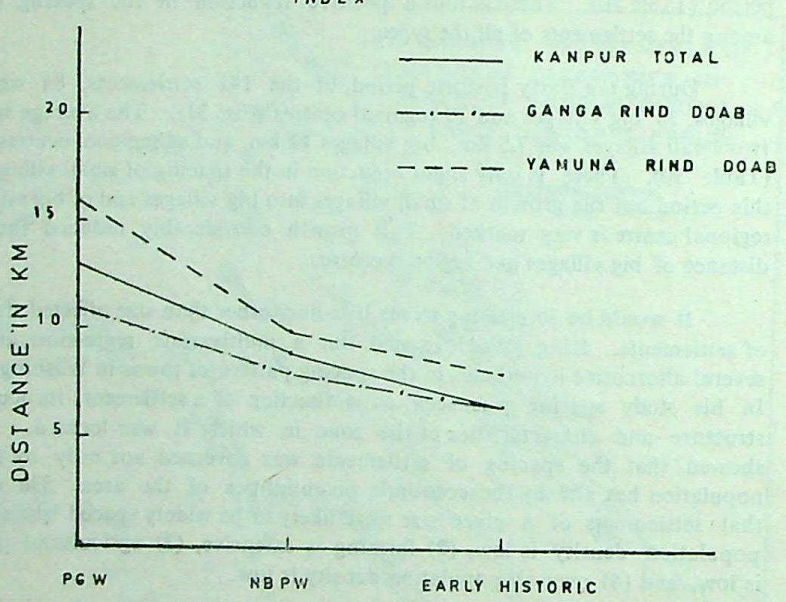

AVERAGE SPACING BETWEEN TWO SETTLEMENTS IN GANGA-RIND, YAMUNA-RIND DOAB AND TOTAL KANPUR DISTRICT

FIG. : 32.

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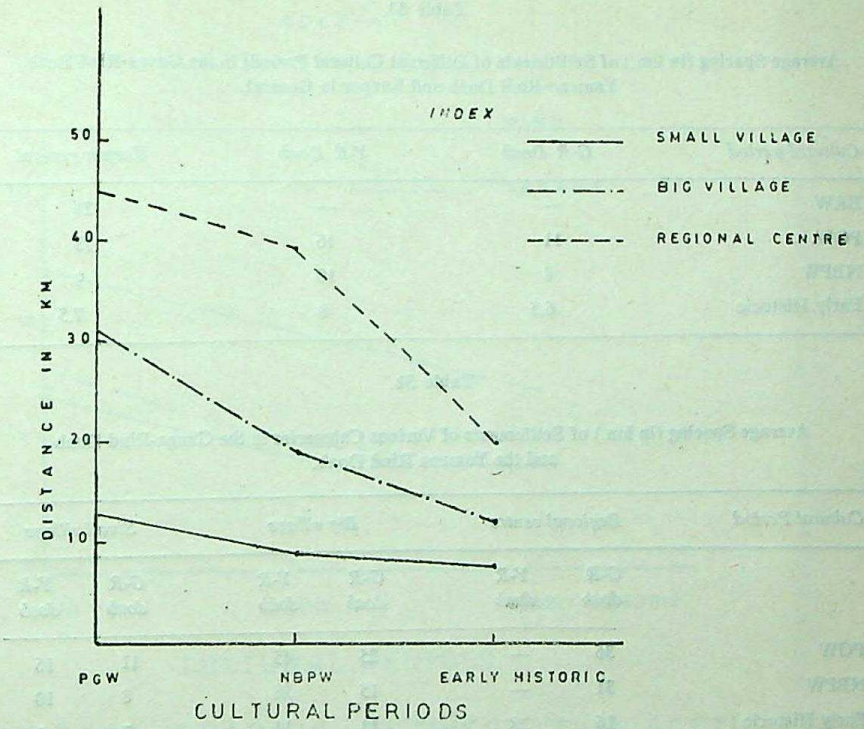

AVERAGE SPACING BETWEEN TWO SETTLEMENTS OF A GIVEN CATEGORY DURING DIFFERENT CUTURAL PERIODS IN KANPUR DISTRICT

FIG. : 33.

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Table 31.

Average Spacing (in km.) of Settlements of Different Cultural Periods in the Ganga-Rind Doab, Yamuna-Rind Doab and Kanpur in General.

Cultural period	*G-R Doab*	*Y-R Doab*	*Kanpur general*
BRW	—	—	29
PGW	11	16	13
NBPW	8	10	9
Early Historic	6.5	8	7.5

Table 32.

Average Spacing (in km.) of Settlements of Various Categories in the Ganga-Rind Doab and the Yamuna Rind Doab.

Cultural Period	*Regional centre*		*Big village*		*Small village*	
	G-R doab	*Y-R doab*	*G-R doab*	*Y-R doab*	*G-R doab*	*Y-R doab*
PGW	36	—	25	45	11	16
NBPW	31	—	15	28	8	10
Early Historic	16	28	11	14	7	8

Table 33.

Spacing (in km.) Pattern Between Two Settlements on the Rivers Ganga, Rind and Sengur During Different Cultural Periods.

Cultural Period	*Ganga*			*Rind*			*Sengur*		
	Maximum	*Minimum*	*Average*	*Maximum*	*Minimum*	*Average*	*Maximum*	*Minimum*	*Average*
PGW	17	3	7	22	4.5	8	15	7	13
NBPW	12	1.5	4.5	15	2	5	15	5	9.5
Early Historic	12	1	4	11	1	4	14	2.5	7

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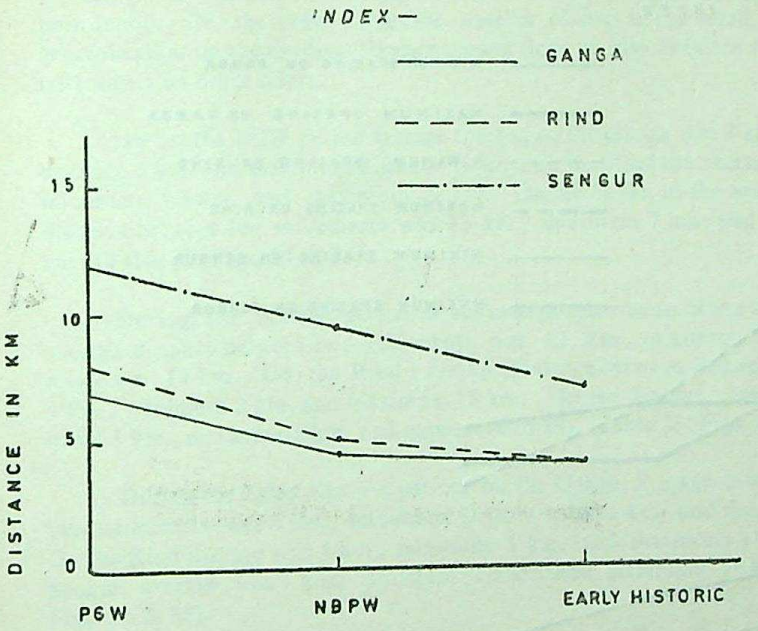

AVERAGE SPACING BETWEEN TWO SETTLEMENTS ON DIFFERENT RIVERS IN KANPUR DISTRICT

FIG. : 34.

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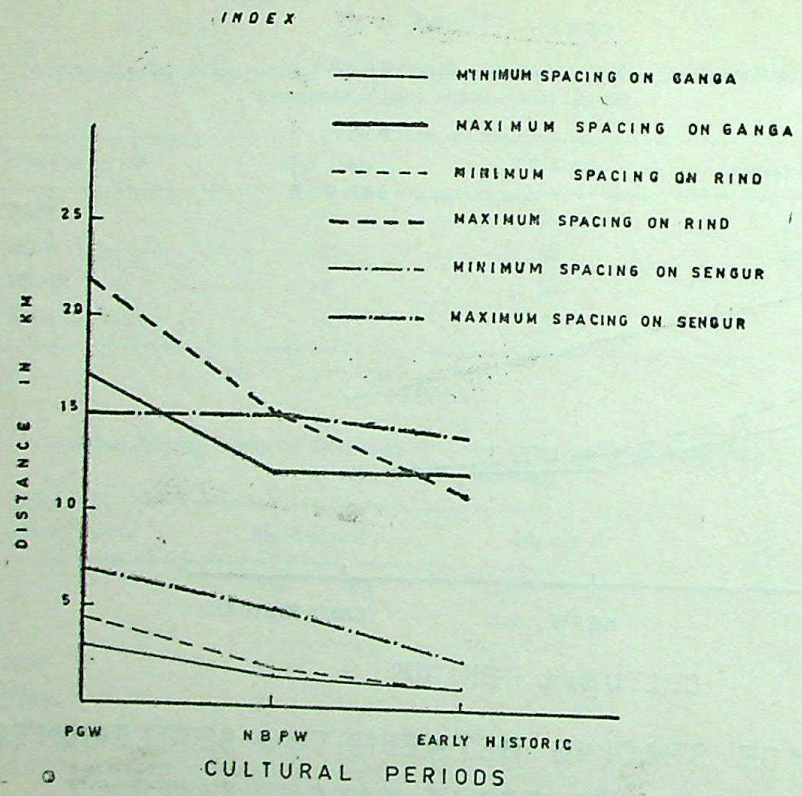

MINIMUM AND MAXIMUM SPACING BETWEEN TWO SETTLEMENTS ON DIFFERENT RIVERS IN KANPUR DISTRICT

FIG. : 35.

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the Ganga, the Rind and the Sengur because on them a large number of sites have been found. On the other rivers the number of sites is too small to make any generalization on the average distance among them as also between them and the settlements on other rivers.

During the PGW period average spacing on the Ganga was 7 km., minimum distance 3 km. and maximum distance 17 km.; on the Rind the average was 8 km., minimum 4.5 km. and maximum 22 km. On the banks of the Sengur, average distance between two settlements was 13 km., minimum 7 km. and maximum 15 km. (Table 33, Figs. 34 & 35).

During the NBPW period in the case of settlements along the Ganga the average distance between two settlements was 4.5 km., minimum 1.5 km. and maximum 12 km. On the Rind : average distance between two settlements was 5 km., minimum 2 km. and maximum 15 km. On the Sengur : average distance was 9.5 km., minimum 5 km. and maximum 15 km. (Table 33, Figs. 34 & 35).

During the Early Historic period, on the Ganga, average distance between two settlements was 4 km., minimum a little over 1 km. and maximum 12 km. On the Rind average was 4 km., minimum 1 km. and maximum 11 km. On the Sengur, average was 7 km., minimum 2.5 km. and maximum 14 km. (Table 33, Figs. 34 & 35).

Nearest-Neighbour Analysis

Explicit in the concept of archaeological settlement pattern studies is the assumption that a pattern does exist, and one has to detect it. Nearest-neighbour analysis offers a high degree of objectivity for the description and distribution of the settlements that may be mapped as points.

Before examining the archaeological data for nearest-neighbour analysis, I will briefly describe the methodology used and the theoretical framework in which results are to be interpreted. Of particular relevance in this context are the various models from locational geography (Dacey 1962, King 1962, Getis 1964) and ecology (Clark and Evans 1954; Clark 1956; Pielou 1959, 1961; Hansen and Remenga 1961; Evans 1969) which deal with the distribution that deviates from the random. A random distribution means that "all individuals have an equal possibility of recurring at any given point on a surface" (Earle 1976 : 197). The deviation from random pattern can be of two types : (1) Individuals can be more clustered than expected in random distribution with the extreme case occurring when all individuals are located at one point. This type of distribution is a possible result of attraction of individuals towards a strategic (necessary and localized) resource or of the nature of the generative process where new individuals originate from one or more parent individuals already located in space (Ellison and Harris 1972, Earle 1976). Clustering of sites may also occur around a more

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important site such as a major town or religious centre. Population is attracted to such nodes in order to, for example, obtain protection or to be able to take advantage of the greater range of functions and activities available (Hodder 1972; Hodder and Orton 1976). (2) Individuals can be more regularly spaced than expected, with maximum regularity occurring when straight lines drawn between all individuals form a hexagonal pattern. The regular distribution is the result of evenly distributed resources and "mutual antagonism of individuals upon each other's location" (Earle 1976 : 197).

As originally described by Clark and Evans (1954), the distance-to-nearest-neighbour (closest individual in any direction to a given individual) is a direct measure of spacing. The nearest neighbour statistic expresses a departure from randomness as ratio (R) of mean distances observed ($\bar{r}\,A$) for the study of settlements to the mean distance expected ($\bar{r}\,E$) for randomly distributed settlements of a given density :

$$R = \frac{\bar{r}\,A}{\bar{r}\,E}$$

The factor $\bar{r}\,E$ is derived from the formula :

$$\bar{r}\,E = \frac{1}{2\sqrt{P}}$$

Where P is the density of sites per sq. km. which is obtained by dividing the total number of sites obtained from survey by total surveyed area in sq. km. For example if 15 sites were located in an area of 450 sq. km. then the settlement density would be 0.03 per sq. km. From the formula $\left(\bar{r} = \frac{1}{2\sqrt{P}}\right)$ the expected distance to nearest-neighbour in a random distribution of such density would be $\frac{1}{2\sqrt{0.03}}$ or 2.75 km. If observed distance to nearest-neighbour is greater than this 'expected' value, the ratio will be more than one and indicate regular spacing; if less, the ratio will be below one and indicate aggregation.

However, it should be emphasized here that the density used to determine $\bar{r}\,E$ should be derived in some independent manner, like quadrate sampling. This density can be measured in any specified unit, but these units must correspond to those used to measure distance to nearest-neighbour. It is always better if we have sample of a bigger area which has been surveyed intensively.

In the present study the distance of each settlement to its nearest-neighbour has been estimated for all the settlements rather than leaving out the settlements which are located more than 14 km. away from the nearest-neighbour as suggested by Pielou (1962). According to Pielou if the settlements which are more than 14 km. away from the nearest-neighbour are included in estimation they will increase the average nearest-neighbour distance. In the present study I have

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included all the settlements for two reasons. First only three settlement fall in the above category, and secondly since for all other estimation the total area of Kanpur district has been considered, it will be wrong to exclude the area where sites are located beyond distance of 14 km.

Nearest-Neighbour Analysis in Kanpur District

Nearest-neighbour analysis for Kanpur district is done at two levels.

Level One

At level one all the sites regardless of their size have been considered. Table 34 gives expected and observed distances between two settlements during different cultural periods in the Ganga-Rind doab, Yamuna-Rind doab and total Kanpur district. Except for the Early Historic period in the Yamuna-Rind doab, in all other estimates the observed distance is more than the expected distance (Fig. 36). For the Early Historic period in the Y-R doab observed and expected distances are the same. The ratio of observed and expected (Table 35, Fig. 37) shows that during the PGW period settlements were regularly spaced but in the G-R doab the aggregation of settlements was greater than in the Y-R doab. During the NBPW period again the ratio between the observed and expected distances is more than one, indicating that, in general, settlements were regularly spaced. But during this period we see a reverse trend of spacing when we compare the ratio pattern in the G-R doab to that in the Y-R doab. Unlike during the previous period the aggregation of settlements during this period was greater in the Y-R doab, though the total area of the Y-R doab is greater than that of the G-R doab and the number of settlements is less. The main reason for greater aggregation in the Y-R doab is that most of the sites are loated along the river banks and in the small area east of Jahangirabad. A vast area of the Y-R doab is economically unprofitable, and so the settlements are generally located on soil type III and IV of Kanpur type which are found in a limited area.

Table 34.

Expected and Observed Distances (in km.) between the Two Settlements in the Ganga Rind Doab, Yamuna Rind doab and Kanpur in General

Cultural Period	*Ganga-Rind Doab*		*Yamuna-Rind Doab*		*Kanpur*	
	Expected	*Observed*	*Expected*	*Observed*	*Expected*	*Observed*
GW	5.0	6.5	7.0	10.0	6.0	7.0
PNBPW	3.5	4.5	4.5	5.5	4.0	5.0
Early Historic	3.0	4.5	4.0	4.0	3.5	4.0

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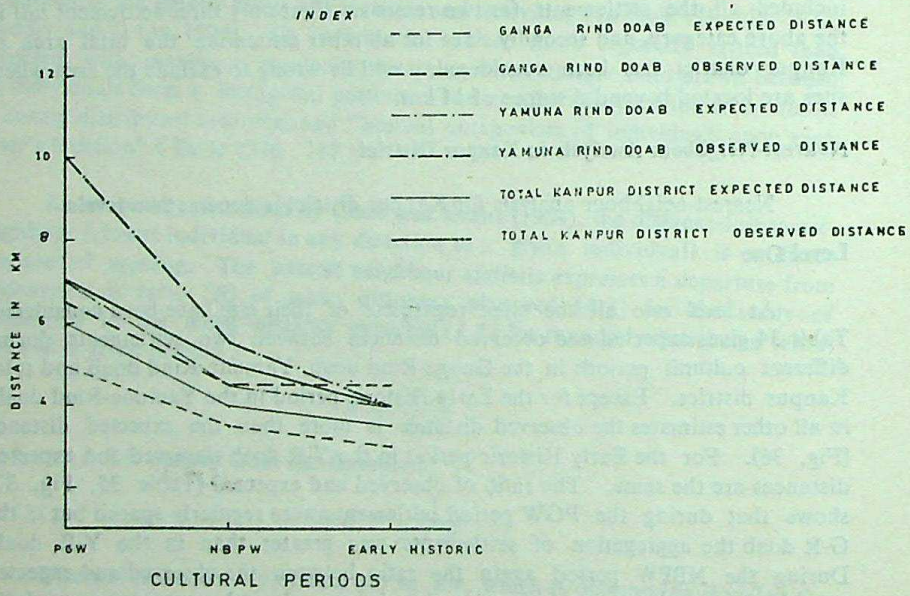

EXPECTED AND OBSERVED DISTANCES BETWEEN TWO SETTLEMENTS DURING DIFFERENT CULTURAL PERIODS IN KANPUR DISTRICT

FIG. : 36.

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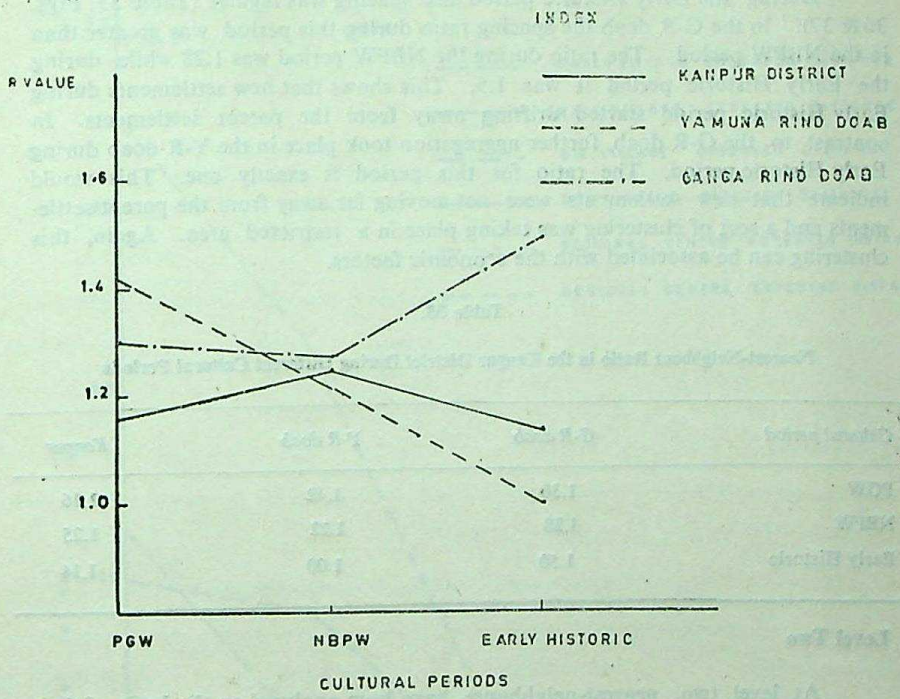

R.VALUES FOR SETTLEMENTS DURING DIFFERENT CULTURAL PERIODS IN GANGA-RIND DOAB, YAMUNA-RIND DOAB AND TOTAL KANPUR DISTRICT

FIG. : 37.

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During the Early Historic period also spacing was regular (Table 35, Figs. 36 & 37). In the G-R doab the spacing ratio during this period was greater than in the NBPW period. The ratio during the NBPW period was 1.28 while during the Early Historic period it was 1.5. This shows that new settlements during Early Historic period started drifting away from the parent settlements. In contrast to the G-R doab, further aggregation took place in the Y-R doab during Early Historic period. The ratio for this period is exactly one. This would indicate that new settlements were not moving far away from the parent settlements and a sort of clustering was taking place in a restricted area. Again, this clustering can be associated with the economic factors.

Table 35.

Nearest-Neighbour Ratio in the Kanpur District During Different Cultural Periods

Cultural period	*G-R doab*	*Y-R doab*	*Kanpur*
PGW	1.30	1.42	1.16
NBPW	1.28	1.22	1.25
Early Historic	1.50	1.00	1.14

Level Two

At level two, nearest-neighbours have been analysed on the basis of their size. Table 36 gives an analysis of observed and expected distances between two settlements of a given type during a particular cultural period. For all the three categories of settlements—small villages, big villages and regional centres—we find that the expected distance is less than observed distance (Fig. 38). Table 37 gives ratio of observed and expected distance between two settlements of a given type during a particular cultural period. The analysis shows that the ratio for regional centres was decreasing from PGW to Early Historic period. This would indicate that slowly aggregation of regional centres was coming up (Fig. 39). But there does not seem to have been any real competition among the regional centres as the ratio of observed and expected distance was still more than one.

Big villages were also regularly spaced as the ratio for all the cultural periods is more than one. But during the NBPW period big villages were more aggregated than in PGW and Early Historic periods.

When we see the ratio of observed and expected distances between two settlements of a given type we find that there is a gradual decrease in the ratio from regional centres to small villages (Table 37, Fig. 39). Only in the case of NBPW we see that the ratio for big villages is less than for small villages. This would indicate that during the NBPW period big villages were more aggregated

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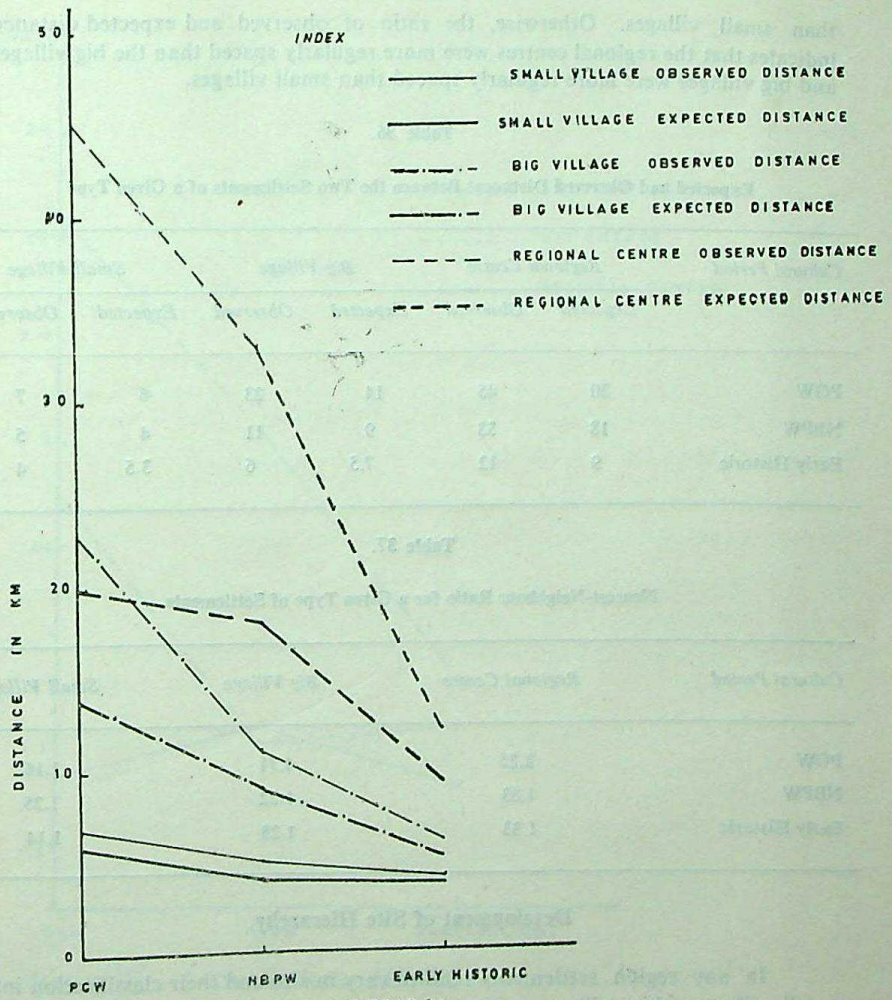

EXPECTED AND OBSERVED DISTANCES BETWEEN TWO SETTLEMENTS OF SAME SIZE DURING DIFFERENT CULTURAL PERIODS IN KANPUR DISTRICT

FIG. : 38.

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than small villages. Otherwise, the ratio of observed and expected distances indicates that the regional centres were more regularly spaced than the big villages, and big villages were more regularly spaced than small villages.

Table 36.

Expected and Observed Distances Between the Two Settlements of a Given Type

Cultural Period	*Regional Centre*		*Big Village*		*Small Village*	
	Expected	*Observed*	*Expected*	*Observed*	*Expected*	*Observed*
PGW	20	45	14	23	6	7
NBPW	18	33	9	11	4	5
Early Historic	9	12	7.5	6	3.5	4

Table 37.

Nearest-Neighbour Ratio for a Given Type of Settlements

Cultural Period	*Regional Centre*	*Big Village*	*Small Village*
PGW	2.25	1.71	1.16
NBPW	1.83	1.22	1.25
Early Historic	1.33	1.25	1.14

Development of Site Hierarchy

In any region settlements tend to vary in size and their classification into small villages, big villages and regional centres suggests an administrative hierarchy. The process by which settlement hierarchies arise are poorly understood. In some areas regional centres often turn out to be among the oldest communities in the area. Such settlements grow in size and increase their administrative function while giving rise to daughter communities, that may never develop similar functions. It may be that as the societies with ranking evolved, senior lineage of higher rank tended to remain at the parent community level while cadet lineage of lower rank founded newer sites (Flannery 1976 : 168-69).

To explain the pattern of hierarchy and its functions models given by geographers (Chistaller 1933, Losch 1954) have often been applied by archaeologists

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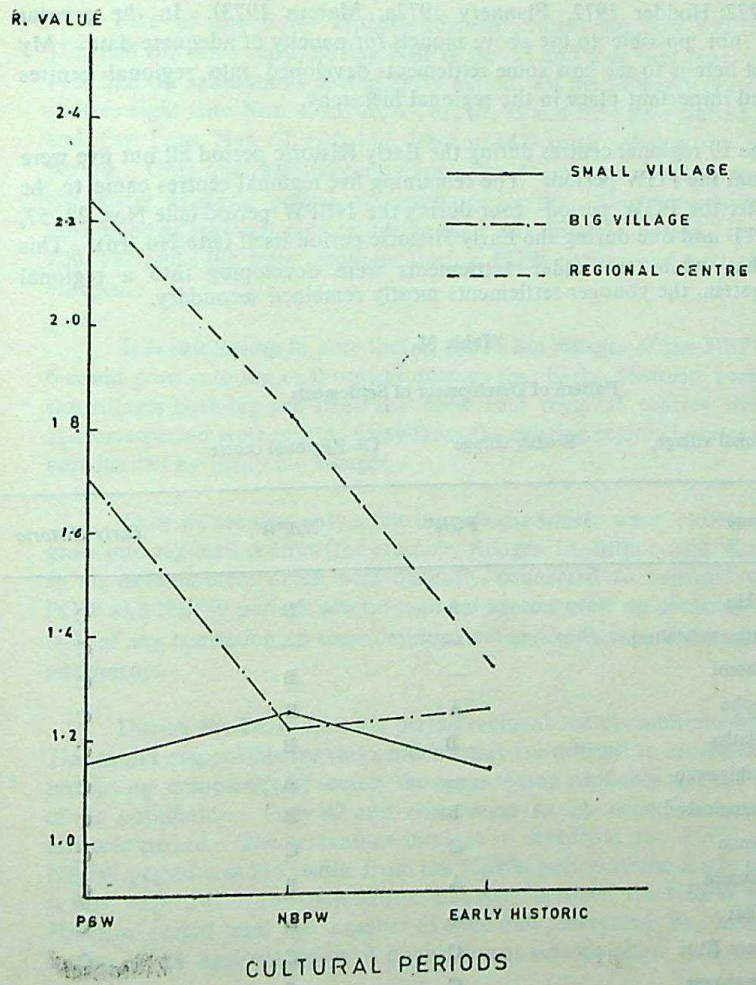

R VALUES FOR DIFFERENT CATEGORIES OF SETTLEMENTS IN KANPUR DISTRICT

FIG. : 39.

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(Johnson 1972; Hodder 1972, Flannery 1972a, Marcus 1973). In the present study it is not possible to use above models for paucity of adequate data. My only attempt here is to see how some settlements developed into regional centres and occupied important place in the regional hierarchy.

Of the 19 regional centres during the Early Historic period all but five were occupied from the PGW period. The remaining five regional centres came to be occupied after the PGW period—four during the NBPW period (site Nos. 23, 57, 75, and 147) and one during the Early Historic period itself (site No. 16). This indicates that while the older settlements were developing into a regional hierarchy system, the younger settlements mostly remained secondary.

Table 38.

Pattern of Development of Settlements

Index : A=Small village, B=Big village C=Regional centre

Site No.	*Name*	*PGW*	*NBPW*	*Early Historic*
4	Ankin	A	B	C
16	Banipara Mahraj	—	—	C
23	Bhaseni	—	B	C
40	Deoha	A	B	C
45	Galatha	B	B	C
57	Hathigawan	—	A	C
61	Jahangirabad	B	B	C
62	Jajmau	C	C	C
67	Kamasia	A	B	C
75	Keilai	—	B	C
79	Khera Kusi	C	C	C
97	Musanagar	C	C	C
100	Nawabganj	A	A	C
102	Nonha Narsingh	A	A	C
105	Palhpur	A	B	C
115	Radhan	C	C	C
117	Rahimpur Bisdhan	A	A	C
146	Udaipur	A	A	C
147	Udaipur	—	A	C

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Five of the Early Historic regional centres (site Nos. 62, 79, 97, 100 and 115) had the same status during NBPW period and four (site Nos. 62, 79, 97 and 115) had the same status during PGW period. Of the 14 newly developed regional centres eight (site Nos. 4, 23, 40, 45, 61, 67, 75 and 105) were classed as big villages and five (site Nos. 57, 102, 117, 146 and 147) small villages during the NBPW period. Only one regional centre (site. No. 16) came to be first occupied during the Early Historic period and developed rapidly. Of the five small villages that developed as regional centres during the Early Historic period, three (site Nos. 100, 117 and 146) were occupied during PGW period, and were classed as small villages.

It is interesting to note that of the 16 big villages of the NBPW period only 6 could grow into regional centres during the Early Historic period. Most of the villages both big and small that grew into regional centres during the Early Historic period were located away from the existing regional centres and were not surrounded by many big villages.

Thus we see that only a few big villages which were closely spaced could grow into regional centres (for example, villages in Bilhor and Kanpur tahsils). In the isolated areas which were distantly connected to regional centres during PGW and NBPW periods several regional centres grew up probably because of the lack of any restriction on their development generally caused by already existing settlements.

During the Early Historic period regional centres multiplied by four times. The causes responsible for this sudden spurt are difficult to ascertain. Besides the increasing complexity of society the main reason probably was the agglomeration of the population. Only 42 new sites came to be occupied during the Early Historic period. The percentage increase in sites from the PGW period to the NBPW period was 215, while from the NBPW period to the Early Historic period it was only 142. The population doubled between the NBPW period to Early Historic period and the number of sites only increased by half. This itself speaks of the agglomeration of population at various sites.

Population

Though archaeologists in the past have shown an interest in demographic factors in the interpretation of archaeological data, it is only during the east two decades that a definite shift from an almost exclusive concern with material remains to a concern with past people and their behaviour has taken place. One facet of this shift in interest is the growing emphasis on estimating the size, density and growth rates of past populations.

Accurate population estimates for individual settlements are of great interest but the factors affecting population size within a given area are so numerous that

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(Johnson 1972; Hodder 1972, Flannery 1972a, Marcus 1973). In the present study it is not possible to use above models for paucity of adequate data. My only attempt here is to see how some settlements developed into regional centres and occupied important place in the regional hierarchy.

Of the 19 regional centres during the Early Historic period all but five were occupied from the PGW period. The remaining five regional centres came to be occupied after the PGW period—four during the NBPW period (site Nos. 23, 57, 75, and 147) and one during the Early Historic period itself (site No. 16). This indicates that while the older settlements were developing into a regional hierarchy system, the younger settlements mostly remained secondary.

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45	Galatha	B	B	C
57	Hathigawan	—	A	C
61	Jahangirabad	B	B	C
62	Jajmau	C	C	C
67	Kamasia	A	B	C
75	Keilai	—	B	C
79	Khera Kusi	C	C	C
97	Musanagar	C	C	C
100	Nawabganj	A	A	C
102	Nonha Narsingh	A	A	C
105	Palhpur	A	B	C
115	Radhan	C	C	C
117	Rahimpur Bisdhan	A	A	C
146	Udaipur	A	A	C
147	Udaipur	—	A	C

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Accurate population estimates for individual settlements are of great interest but the factors affecting population size within a given area are so numerous that

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accurate estimates of populations and densities are, if not impossible, difficult. Size of settlements, structures found in excavation, demographic observation on contemporary settlements and mathematical models given by demographers are some of the means for estimating past populations.

Some demographers have criticised archaeological methods of estimating prehistoric populations. Peterson (1975) criticises archaeologists for over-analysing their data and the use of methods that are crude. At the same time he admits that even in modern estimates 'no nation has ever made a complete and accurate account of its inhabitants and their characteristics so that even in the best cases, what is eventually published invariably includes emendation by the central establishment office. The demographic data of most of the world, moreover, are full of holes and often quite unreliable" (Peterson 1975 : 227).

In spite of methodological shortcomings several attempts have been made to estimate populations of the past in different areas. The methods employed in this attempt are : human skeletal remains (Vallois 1960; Angel 1969, 1972; Brothwell 1971, 1972; Acsadi and Nemeskeri 1970; Weiss 1973), artifacts used by people (Cook 1972; Clark 1954, 1972; Muller-Beck 1961; Shawcross 1967; Pekins and Daly 1968; Evans and Renfrew 1968), ecological potential of human habitat (Birdsell 1953, 1975; Gowgill 1962; Baumhoff 1963; Allen 1965; Casteel 1972; Martin and Reed 1973; Hassan 1974b) and the settlement area (Narrol 1962; Adams 1965; Cook and Heizer 1965, 1968; LeBlanc 1971, Blanton 1972; Renfrew 1972; Casselberry 1974; Plog 1975; Longacre 1976).

The estimation of population on the basis of settlement size is based on the principle that there is some relationship between the number of people and the area they occupy. The formula is as follows :

Number of inhabitants = constant × site area, where constant is the number of persons per unit of site area determined from a modest modern village or town in the area which is thought to be comparable to the archaeological settlements under consideration. The per unit population here is applied for the whole site area which includes both dwelling and inter-dwelling space.[4]

There are, however, several shortcomings in this method. Flatcher (1981 : 102) points out that the area and population estimates are not the truths; rather they are merely a device to aid the comparision that a researcher wishes to make. Defining the exact limits of a settlement and specifying precisely how many people lived on that area cannot be done satisfactorily. Other problems that beset population estimation are (a) duration of occupation, and (b) effective of thickness of deposits (Tolstoy and Fish 1973). The length of occupation seriously affects population estimates. What we want is an estimate of population at a fixed point of time and not over a long period as defined on the basis of ceramic and other archaeological traits. The thickness of deposit also affects the population

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estimate. It is difficult to say whether the pile of waste was accumulated by a large population in a short period, or a small population over a long period.

In the present study the total floor area has been used for the estimation of population. The estimates are obviously very tentative due to various limitations.[5] A better population estimate can be made where the total settlement has been laid bare to show the layout of structures and the relationship of different structures within it.[6] Unfortunately in the whole of the Ganga-Yamuna doab not a single site has been excavated horizontally so as to reveal the settlement layout, and which could have been used as an index for the population estimate. In the absence of such evidence I have depended upon the exhaustive exploration of sites and the use of contemporary settlement data and family size in Kanpur district and Uttar Pradesh.

The average size of the household in Uttar Pradesh (U.P.) for 50 years (1911-1961) was 4.82 (Table 39) and the total variation during the period ranged to 0.58 persons.

Table 39.

Average Household Size in U.P. Between 1911 and 1961

Year	*Rural Average*	*Urban Average*	*Total Average*
1911	4.64	4.54	4.59
1921	4.57	4.54	4.55
1931	4.82	4.40	4.61
1941	5.01	5.25	5.13
1951	5.17	4.87	4.97
1961	5.17	5.03	5.10

About the variations in the average household size *Census of India* (1961 Vol. XI, Part IVA : 105-6) says :

"There was a fall in the size of average household in 1911 owing to an artificial increase in their number due to the prevalence of the plague, on account of which a large number of temporary structures had to be put up. The actual size in 1911 was slightly larger than what the figures indicate. In 1921 there was a fall, but it was insignificant taking into consideration that a large number of empty houses had been counted as occupied. The population fell during the decade 1911-21 by 3.1 percent and number of households by 1.7 percent, thereby causing a decrease in the size of household. In 1931 the population, the number of households and the

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size of households, all showed an increase. About half of the increase in the decade 1921-1931 was due to increase in size of average household, and half due to increase in number of households. The latter was caused by labourers migrating to towns as a result of the abnormal fall in agricultural prices at the end of the decade, leaving the families in villages, and partly due to the continued breaking up of the joint family system. In 1941 the population, the number of households and the size of households again showed an increase. The population during this decade rose by 13.6 per cent while the number of households increased by 7.6 per cent only, resulting in an increase in the size of an average household. More than half of the increase in population in the decade 1931-41 was due to increase in the number of households, and remaining due to increase in the size of an average household. The causes of increase in the number of households were the same as in the previous decade. In the rural areas, owing to favourable agricultural conditions, the tendency towards breaking of joint family system was resumed. The increase in the size of urban household on the other hand, was remarkable. During 1941-51 decade the increase in population and number of households was 12.2 per cent and 11.7 per cent respectively. The size of average household remained practically the same...

"In 1951-61 the population has increased by 16.6 per cent but the number of households has increased only by 12.05 per cent resulting in an increase in the size of an average household. Three-fourths of the population has increased on account of increase in the number of households and one-fourth owing to the increase in the size of average household". (*Census of India* 1961 Vol. XV Part IVA : 105-6).

Thus we see that the average size of households is affected not only by the actual increase in the population but also by migration, construction of new houses, disease and several other factors.

In the Ganga-Yamuna doab in a modest village the total number of houses range between 50 and 60 and the total population between 230 and 300 persons per hectare. This includes non-residencial areas like threshing floors, wells, paths and public buildings. In the present estimate I have taken 4.9 persons per house[7] (the average for fifty years in U.P.) and 55 houses per hectare and this gives 271 persons per hectare. The figures of population estimates given in the tables may seem a bit too exact. This is due to the fact that instead of rounding off the figures I have put the figures as were obtained from calculations.

Protohistoric and Early Historic Populations

During the BRW period the total population of Kanpur district was 4,646 of which 3,224 (69.04%) persons were living on 6 sites in the G-R doab and

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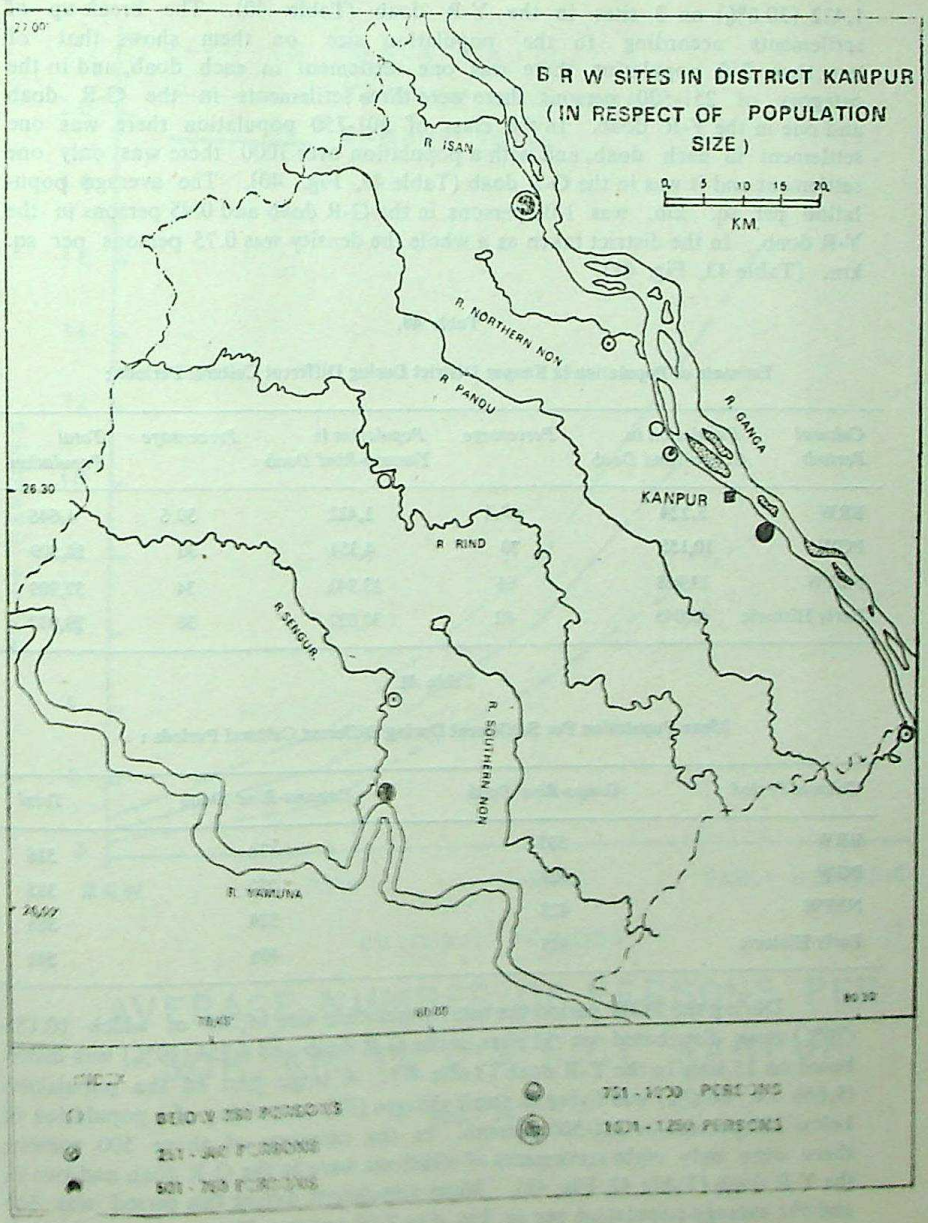

FIG. : 40.

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1,422 (30.6%) on 3 sites in the Y-R doab (Table 40). The break-up of settlements according to the population size on them shows that of less than 250 population there was one settlement in each doab, and in the category of 251-500 persons there were three setilements in the G-R doab and one in the Y-R doab. In the class of 501-750 population there was one settlement in each doab, and with a population over 1000 there was only one settlement and it was in the G-R doab (Table 42, Fig. 40). The average population per sq. km. was 1.06 persons in the G-R doab and 0.45 persons in the Y-R doab. In the district taken as a whole the density was 0.75 persons per sq. km. (Table 43, Fig. 41).

Table 40.

Estimate of Population in Kanpur District During Different Cultural Periods :

Cultural Periods	*Population in Ganga-Rind Doab*	*Percentage*	*Population in Yamuna-Rind Doab*	*Percentage*	*Total Population*
BRW	3,224	69.4	1,422	30.6	4,646
PGW	10,155	70	4,354	30	14,509
NBPW	23,968	66	13,941	34	37,909
Early Historic	49,045	62	30,032	38	79,077

Table 41.

Mean Population Per Settlement During Different Cultural Periods :

Cultural Period	*Ganga-Rind Doab*	*Yamuna-Rind Doab*	*Total*
BRW	537	474	516
PGW	328	290	315
NBPW	428	324	383
Early Historic	615	491	561

During the PGW period the total population was 14,509 of which 10,155 (70%) was distributed on 31 sites in the G-R doab and 4,354 (30%) was distributed on 15 sites in the Y-R doab (Table 40). A large part of the population (9,666 i.e. 66.6%) was living in small villages (38) comprising of a population of below 250 persons or 251-500 persons. In the category of above 500 persons there were only eight settlements of which six were in the G-R doab and two in the Y-R doab (Table 42, Fig. 42). Mean population during this period was 315 and the average population per sq. km. was 2.35 persons. The average population per sq. km. in the G-R doab was 3.34 and in the Y-R doab 1.39 persons (Table 43, Fig. 41).

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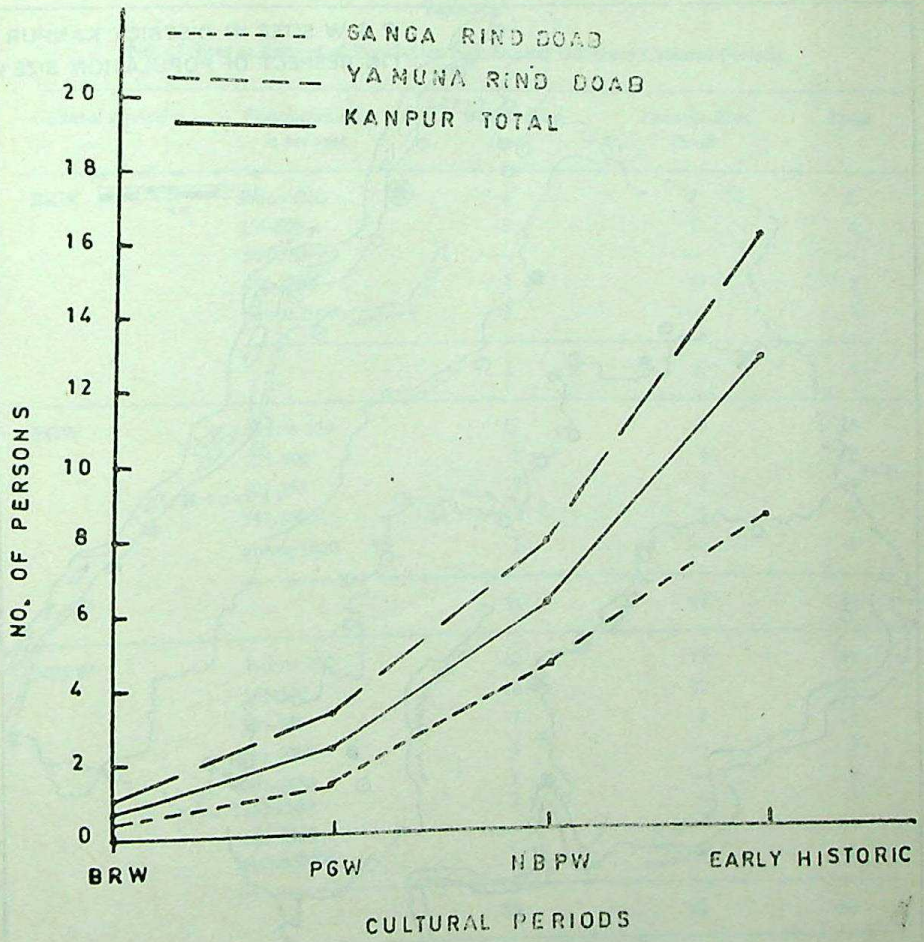

AVERAGE NUMBER OF PERSONS PER SQR. KM. IN DISTRICT KANPUR

FIG. : 41.

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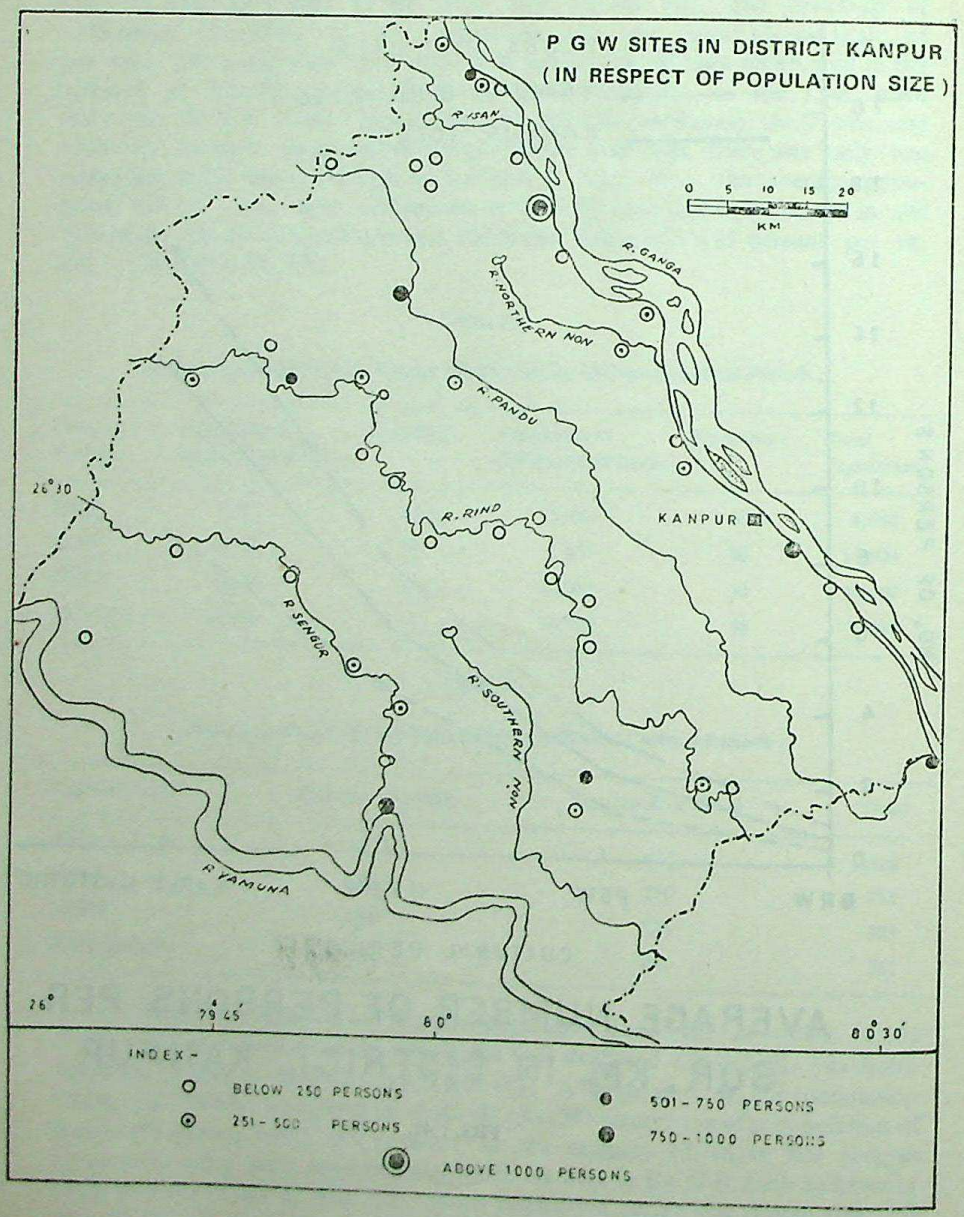

FIG. : 42.

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Table 42.

No. of Sites in Respect of Population Size During Different Cultural Periods.

Cultural Period	*Population size in persons*	*Ganga-Rind Doab*	*Yamuna-Rind Doab*	*Total*
BRW	Below 250	1	1	2
	251-500	3	1	4
	501-750	—	—	—
	751-1000	1	1	2
	above 1000	1	—	1
		6	3	9
PGW	Below 250	17	9	26
	251-500	8	4	12
	501-750	3	1	4
	751-1000	2	1	3
	above 1000	1	—	1
		31	15	46
NBPW	Below 250	22	19	41
	251-500	18	19	37
	501-750	7	4	11
	751-1000	5	—	5
	1001-1250	1	—	1
	1251-1500	2	1	3
	1501-2000	—	—	—
	above 2000	1	—	1
		56	43	99
Early Historic	Below 250	19	16	35
	251-500	27	22	49
	501-750	11	11	22
	751-1000	9	7	16
	1001-1250	5	1	6
	1251-1500	3	1	4
	1501-2000	4	3	7
	2001-3000	1	—	1
	Above 3000	1	—	1
		80	60	141

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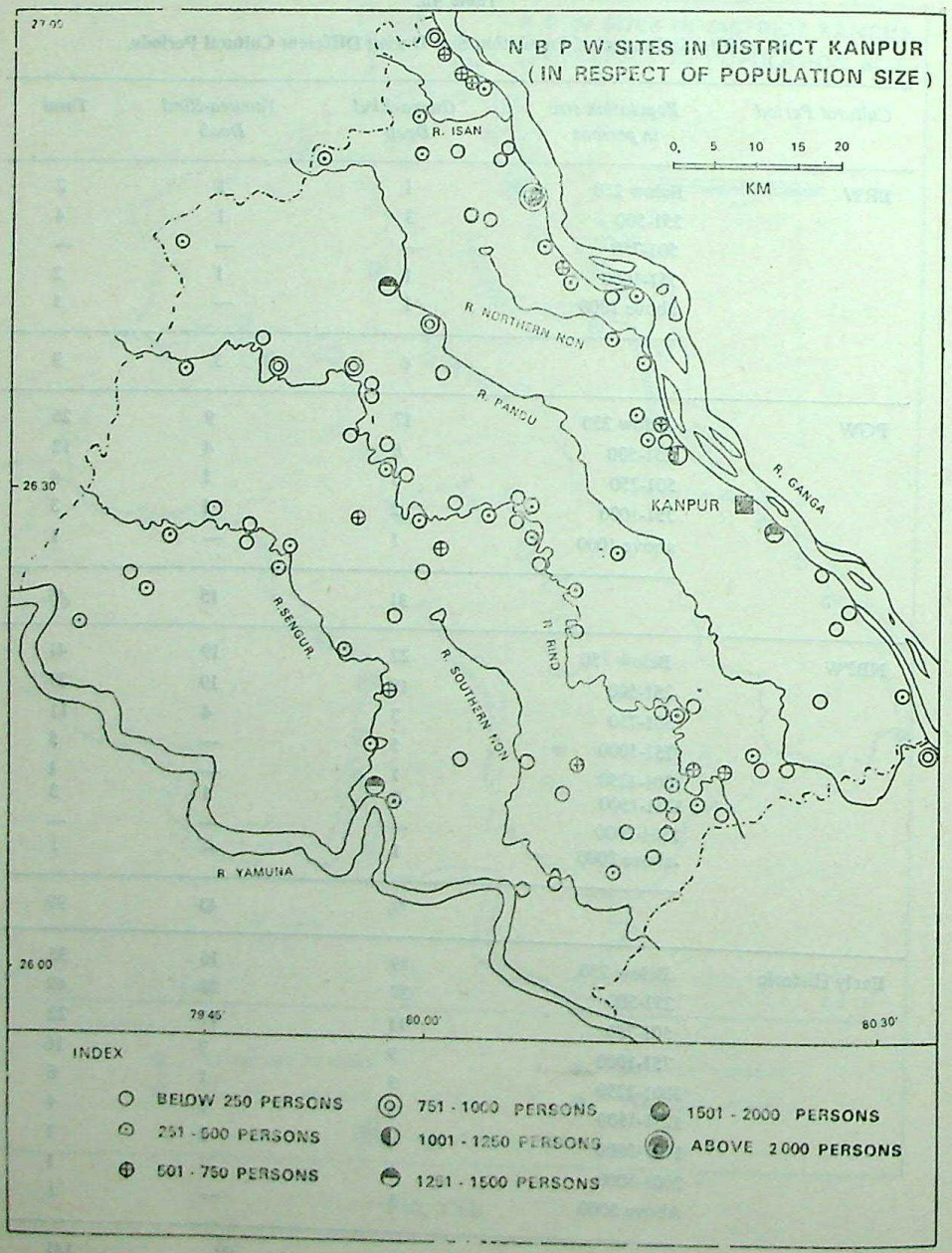

FIG. : 43.

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During the NBPW period the total population of the district was 37,909. The number of inhabitants in the G-R doab was 23,968 (66%) and in the Y-R doab 13,941 (34%). During this period also we find that a large portion of the population (21,431 i.e. 56.5%) was living in small villages i.e. in the category of below 250 and 251-500 persons per settlement. In the category of above 500 population there were 21 settlements of which 16 were in the G-R doab. In the G-R doab there were four settlements with population more than 1,000 (Table 42, Fig. 43). The pattern of population growth shows that on 13 sites (Site Nos. 6, 39, 61, 68, 71, 74, 88, 124, 129, 136, 139, 140 and 143) population remained at the level of the PGW period. Most of these sites are on the tributaries or away from rivers. Settlements on the bank of the Ganga show a remarkable increase in size. The total increase in some cases was more than 250 per cent.

The mean population per settlement was 383 persons (Table 41). The population per sq. km. in the district was 6.15. It was 7.88 in the G-R doab and 4.46 in the Y-R doab.

Table 43.

Average Population per sq. km. During Different Cultural Periods

Cultural Period	*Gang-Rind Doab*	*Yamuna-Rind Doab*	*Mean*
BRW	1.06	0.45	0.753
PGW	3.34	1.39	2.35
NBPW	7.88	4.46	6.15
Early Historic	16.13	9.6	12.82

During the Early Historic period total population was 79,077 and it was widely distributed. The population in the G-R doab was 49,095 (62% of the total as against to 66% during the NBPW and 70% during the PGW and BRW periods) and in the Y-R doab it was 30,032 (38% of the total as against to 34% during the NBPW and 30% during the PGW and BRW periods, Fig. 48). It is important to note that of the 88 sites where habitation continued from earlier periods, the population remained at the NBPW level on at least 38 sites (site Nos. 3, 5, 8, 10, 15, 17, 28, 31, 32, 34, 35, 48, 50, 53, 55, 66, 69, 72, 74, 76, 82, 91, 101, 106, 110, 114, 118, 122, 127, 128, 132, 133, 135, 137, 138, 142, 144 and 150).

During the Early Historic period, also, villages were predominantly small. The villages in the categories of below 250 and 251-500 population numbered 84 and in the category of 501-750 persons 22 and in the category of 751-1000 persons 16. The villages with a population more than 1,000 were 19. Among these the population of 9 villages was more than 1,500. Of the 57 villages with a population above 500, 34 were in the G-R doab and 23 in the Y-R doab. (Table 42, Fig. 44).

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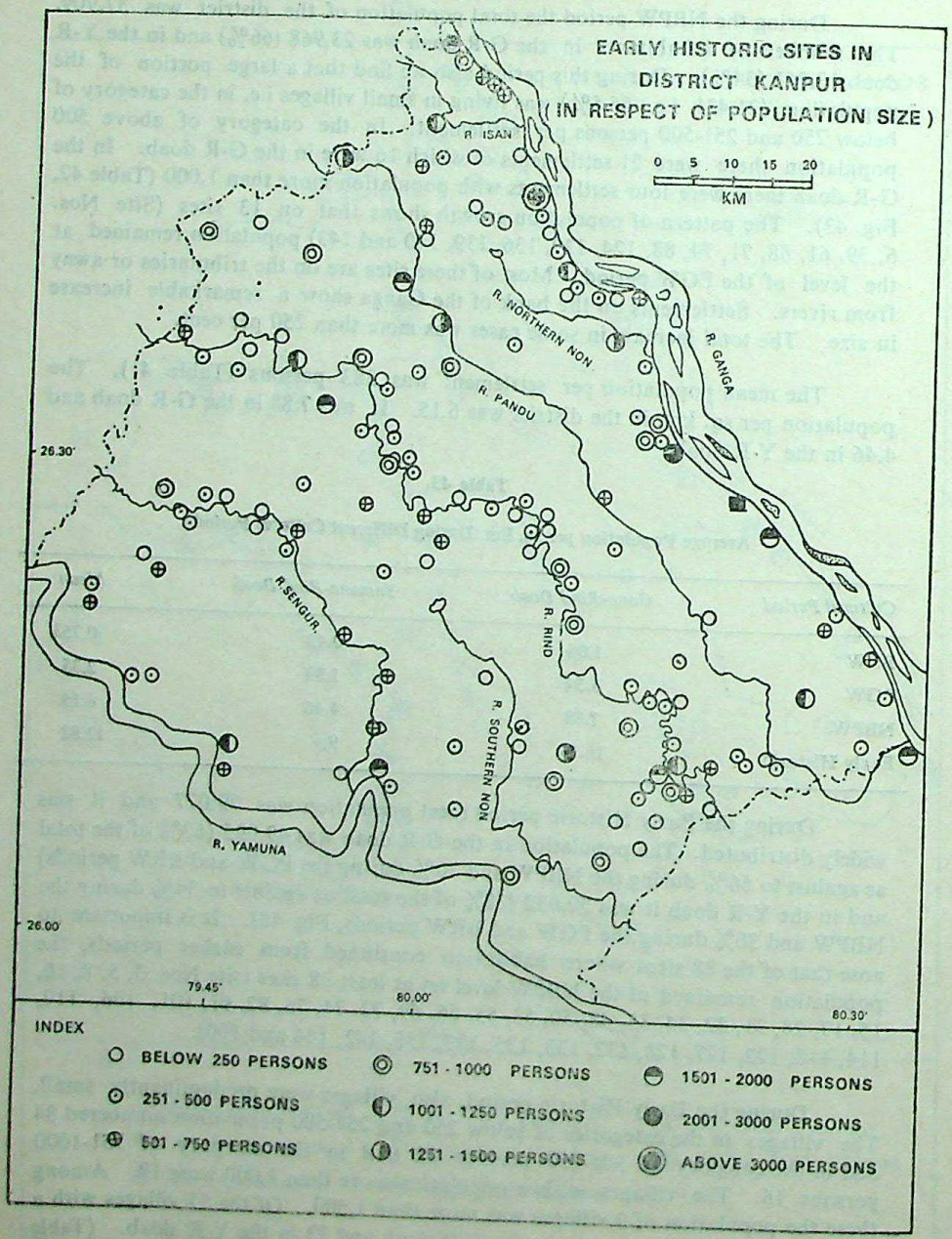

FIG. : 44.

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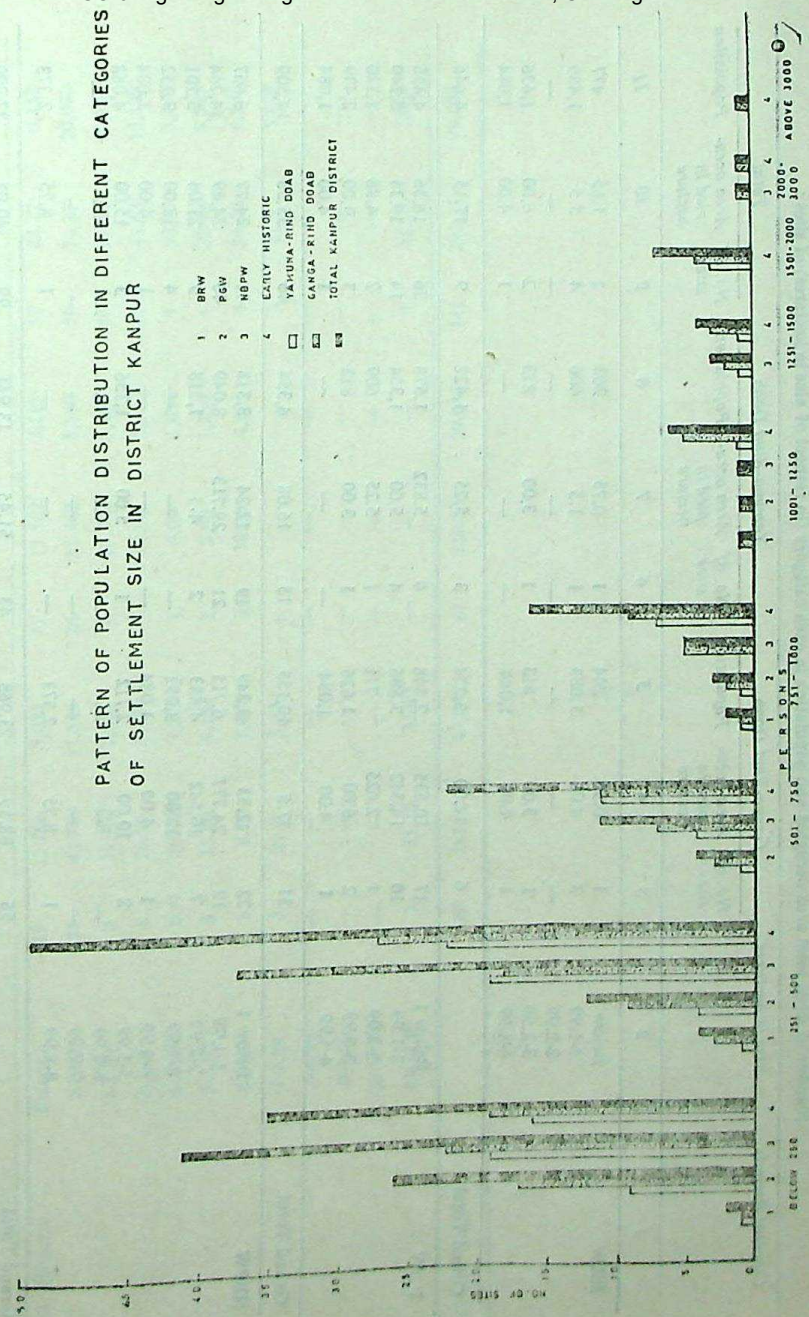

FIG. : 45.

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Table 44.

Number of sites, total area occupied and population in each category (in respect of size in hectares) of sites :

Cultural Periods	*Size in hectares*	*Ganga-Rind Doab*			*Yamuna-Rind Doab*			*Total*		
		No. of sites	*Area occupied in hectare*	*Population*	*No. of sites*	*Area occupied in hectare*	*Population*	*No. of sites*	*Area occupied in hectare*	*Population*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
BRW	Below 1	1	0.90	244	1	0.75	203	2	1.65	477
	1-1.99	3	4.00	1,083	1	1.5	406	4	5.5	1,489
	2-2.99	—	—	—	—	—	—	—	—	—
	3-3.99	1	3.00	813	1	3.00	813	2	6.00	1,626
	4-4.99	1	4.00	1,084	—	—	—	1	4.00	1,084
Grand Total		6	11.90	3,224	3	5.25	1,422	9	17.15	4,646
PGW	Below 1	17	10.535	2,848	9	5.832	1,578	26	16.36	4,426
	1-1.99	10	14.342	3,886	4	5.00	1,354	14	19.34	5,240
	2-2.99	1	2.625	711	1	5.25	609	2	4.88	1,320
	3-3.99	2	6.00	1,626	1	3.00	813	3	9.00	2,439
	4-4.99	1	4.00	1,084	—	—	—	1	4.00	1,084
Grand Total		31	37.5	10,155	15	16.08	4,354	46	53.58	14,509
NBPW	Below 1	22	12.53	3,349	19	12.24	3,318	41	24.77	6,667
	1-1.99	19	24.777	6,715	21	29.713	8,049	40	54.49	14,764
	2-2.99	7	16.542	4,483	2	4.5	1,218	9	21.04	5,701
	3-3.99	4	12.00	3,252	—	—	—	4	12.00	3,252
	4-4.99	1	4.00	1,084	—	—	—	1	4.00	1,084
	5-5.99	2	10.00	2,712	1	5.00	1,356	3	15.00	4,068
	6-6.99	—	—	—	—	—	—	—	—	—
	7-7.99	—	—	—	—	—	—	—	—	—
	8-8.99	1	8.75	2,373	—	—	—	1	8.75	2,373
Grand Total		56	88.59	23,968	43	51.45	13,941	99	140.05	37,909

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1	2	3	4	5	6	7	8	9	10	11
Early Historic	Below 1	19	11.206	3,037	17	11.562	3,115	36	22.77	6,152
	1-1.99	31	42.775	11,543	24	31.462	8,530	55	74.23	20,073
	2-2.99	8	19.497	5,257	8	18.935	5,128	16	38.43	10,385
	3-3.99	8	26.71	7,239	7	21.92	5,940	15	48.63	13,179
	4-4.99	6	26.8487	7,276	1	4.00	1,084	7	30.85	8,360
	5-5.99	3	15.49	4,189	1	5.00	1,356	4	20.49	5,545
	6-6.99	1	6.00	1,626	3	18.00	4,879	4	24.00	6,505
	7-7.99	3	21.5	5,829	—	—	—	3	21.5	5,829
	8-8.99	—	—	—	—	—	—	—	—	—
	9-9.99	—	—	—	—	—	—	—	—	—
	10-10.99	—	—	—	—	—	—	—	—	—
	11-11.99	1	11.25	3,049	—	—	—	1	11.25	3,049
Grand Total		80	181.27	49,045	61	110.88	30,032	141	292.15	79,077

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Table 45.

Settlement-wise Population Estimate During Different Cultural Periods in District Kanpur

(@ 271 persons per hect.)

S. No.	*Name of the site*	*Pd. A*	*Pd. B*	*Pd. C*	*Pd. D*
1	*2*	*3*	*4*	*5*	*6*
1.	Ainti	—	189	284	406
2.	Akbarpur	—	—	—	406
3.	Amauli	—	—	216	216
4.	Ankin	—	406	813	1,626
5.	Antapur	—	216	325	325
6.	Atwa	—	298	298	569
7.	Attwa	—	—	195	—
8.	Aujhan	—	406	762	762
9.	Auron Tahirpur	—	174	—	—
10.	Bachna	—	216	406	406
11.	Badan Newada	—	—	121	219
12.	Badshahpur	—	—	293	455
13.	Bahbalpur	—	—	—	813
14.	Bairi	—	—	474	949
15.	Balai Khurd	—	195	338	338
16.	Banipara Mahraj	—	—	—	1,626
17.	Bara	—	—	180	180
18.	Barauli	—	—	—	271
19.	Behta	—	—	—	427
20.	Berhat	—	—	174	422
21.	Bewaine	—	162	341	593
22.	Bhadars	—	271	434	813
23.	Bhaseni	—	—	569	1,184
24.	Bhiwan	—	—	—	271
25.	Bhisar	—	—	—	130
26.	Bhitargaon	—	—	—	813
27.	Bihupur	—	—	153	325
28.	Bijaipur	406	406	609	609
29.	Binaur	—	—	—	813
30.	Birahar	—	—	358	566
31.	Biria Derapur—A	—	—	216	216
32.	Biria Derapur—B	—	—	162	162
33.	Buhnar	—	189	338	678
34.	Chandanpur	—	174	174	174
35.	Chandanpur	—	—	373	373

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1	2	3	4	5	6
36.	Chaparghata	—	—	—	216
37.	Chaurah	—	—	—	528
38.	Chilauli	—	—	—	325
39.	Debipur	—	216	216	338
40.	Deoha	—	216	338	1,084
41.	Durgapur	—	—	162	244
42.	Gadanpur Chorsa	—	—	—	216
43.	Gahlon-A	—	—	—	94
44.	Gahlon-B	—	—	152	356
45.	Galatha	406	711	813	1,518
46.	Garhia Sikandra	—	—	—	373
47.	Gaupur	—	—	—	130
48.	Ghatwa	—	—	216	216
49.	Gilwat	—	—	609	813
50.	Gobrauri	—	—	271	271
51.	Gopalpur	—	—	—	271
52.	Guraiya-A	—	—	—	151
53.	Guraiya-B	—	—	298	298
54.	Gurdahi Khurd	—	—	—	474
55.	Gurgaon	—	—	195	195
56.	Hathei	—	—	—	183
57.	Hathigaon	—	—	216	1,085
58.	Hulasipur	—	—	—	216
59.	Indayan	203	203	474	813
60.	Indurukh	—	—	440	921
61.	Jahangirabad	—	609	609	1,356
62.	Jajmau	813	813	1,356	1,898
63.	Kakwan-A	—	—	—	501
64.	Kakwan-B	—	—	—	61
65.	Kamalpur	—	—	—	389
66.	Kamsan	—	—	130	130
67.	Kamasia	—	509	813	1,220
68.	Karankhera	—	67	67	—
69.	Karchalipur	—	216	645	645
70.	Karchalipur	—	—	434	694
71.	Kashipur-A	—	102	102	—
72.	Kashipur-B	—	—	162	162
73.	Kashipur-C	—	—	—	271
74.	Katka	—	406	406	40
75.	Keilai	—	—	813	1,410

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1	2	3	4	5	6
76.	Khajuri	—	—	203	203
77.	Khalla	—	—	—	271
78.	Kheora	244	244	509	828
79.	Kherakursi	—	813	1,356	1,898
80.	Khirsa	—	—	—	273
81.	Karankhera-A	—	—	—	281
82.	Karankhera-B	—	—	158	158
83.	Kishora	—	—	—	271
84.	Kismara	—	—	—	481
85.	Kurain	—	—	298	813
86.	Kurtha	—	—	—	338
87.	Lala Bhagat	—	—	—	949
88.	Lamhra	—	142	142	254
89.	Mahraj Nagar	—	—	—	338
90.	Mahrajpur	—	—	153	528
91.	Mahulia	—	—	135	135
92.	Mandauli	—	—	65	325
93.	Mathurapur	—	—	—	954
94.	Mati Kisanpur	—	—	130	—
95.	Mawar	—	271	406	684
96.	Milanpur	—	130	423	560
97.	Musanagar	813	813	1,356	1,627
98.	Narainpur	—	—	—	146
99.	Nar Khurd	—	—	—	684
100.	Nawabgang	406	406	1,084	2,033
101.	Nibia Khera	—	—	219	219
102.	Nonha Narsingh	271	271	347	1,423
103.	Padri Lalpur	—	—	136	325
104.	Pahewa	—	—	—	271
105.	Palahpur	—	271	542	1,186
106.	Panchgawan	—	195	271	271
107.	Panka	—	—	—	101
108.	Panki	—	—	—	509
109.	Parsaurah	—	—	—	101
110.	Pasikhera	—	—	170	170
111.	Pichora	—	—	—	352
112.	Pipergaon	—	—	—	130
113.	Pooran Purwa	—	—	338	949
114.	Pura Shukul	—	—	121	121
115.	Radhan-A	1,084	1,084	2,373	3,049

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1	2	3	4	5	6
116.	Radhan-B	—	—	—	338
117.	Rahimpur Bisdhan	—	121	271	1,356
118.	Raipur	—	—	338	338
119.	Ranipur	—	—	174	325
120.	Rasdhan	—	—	357	711
121.	Rasulpur Bhuranda	—	162	338	509
122.	Rathipur	—	—	305	305
123.	Rataipur	—	—	121	271
124.	Ratanpur-A	—	158	158	—
125.	Ratanpur-B	—	—	—	174
126.	Reona	—	—	203	338
127.	Rohini	—	—	174	174
128.	Sanjeti Badshahpur	—	509	678	678
129.	Sambhalgarh	—	173	173	—
130.	Salempur Mahera	—	—	—	174
131.	Sambhua	—	—	—	305
132.	Sandila	—	—	271	271
133.	Sanihapur	—	387	678	678
134.	Sankim Buzurg	—	—	—	509
135.	Sanon	—	—	352	352
136.	Sapai	—	216	216	949
137.	Saraiganj	—	162	427	427
138.	Seng-A	—	—	213	213
139.	Seng-B	—	130	130	—
140.	Siddhapur Sheoli	—	423	423	949
141.	Terhwa	—	—	—	273
142.	Tegaine	—	—	509	509
143.	Tora-A	—	102	102	—
144.	Tora-B	—	—	418	418
145.	Turrayya	—	—	162	162
146.	Udaipur	—	—	—	1,084
147.	Udaipur	—	—	406	1,626
148.	Umran	—	—	509	711
149.	Uttha	—	130	—	383
150.	Valmiki Ashram	—	—	325	325

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Table 46.

Percentage of Villages and Population in Different Size Categories from Second Millennium B.C. to the Present

Cultural Periods/ Year	*Less than 500*		*500-999*		*1000-1999*		*2000-4999*		*5000-9999*	
	1	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*
P.G.W.	82.60	59.60	15.22	32.99	2.17	7.47	—	—	—	—
NBPW	78.78	52.51	16.66	27.65	4.44	13.59	1.11	6.26	—	—
Early Historic	59.57	28.49	26.49	34.34	12.05	30.74	1.41	6.43	—	—
1901	63.80	30.00	23.00	30.20	10.70	26.90	2.40	12.40	0.10	0.50
1911	67.25	28.28	20.99	25.16	9.89	22.44	1.82	8.45	—	—
1921	68.60	35.50	21.50	32.40	8.40	23.90	1.40	7.50	0.10	0. 0
1931	67.05	26.92	21.85	24.99	8.13	19.12	2.01	8.40	0.05	0.54
1941	61.41	20.14	25.35	21.97	10.45	17.63	2.72	8.90	0.10	0.67
1951	55.60	24.30	27.40	30.80	13.40	27.60	3.60	17.30	—	—
1961	46.30	18.10	30.90	29.50	17.90	32.90	4.5	16.7	0.40	2.80
1971	36.70	12.20	33.00	25.90	22.00	33.80	7.50	22.9	0.80	5.20

1. Percentage of villages in this class to the total number of villages.
2. Percentage of Population in this class to the total population.

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The mean population of settlements during this period was 561. The average population per sq. km. in the G-R doab was 16.13 and Y-R doab 9.6 (Table 43, Fig. 41).

In general, we see that with the increase in population from BRW to Early Historic period there has been increase not only in the number of settlements but also in the size of settlements. But the most distinct thing is that in the G-R doab not only the settlements are more in number than in the Y-R doab but also bigger in size. Thus, the average population density per sq. km. is more in the G-R doab than in the Y-R doab confirming the present pattern of population density in the same area.

After the above analysis of the size and distribution of population in the area we shall now turn towards a comparison of the past and present pattern of settlement and population distribution in different categories (according to size). Table 45 gives the percentage of settlements and the population on them in different categories right from BRW period to the present. The analysis clearly shows that from PGW to Early Historic period there has been a gradual increase in the size of settlements and the population living in them. The number of settlements and the population living on them has gradually declined while the number of settlements in the higher categories have increased and so the population living on them. After the Early Historic periods distribution pattern when we look at the *Census Reports* of this century we find that from Early Historic period to 1941 the pattern of settlements and population distribution did not change much. The estabilization in the ratio of settlements and population which came in the beginning of the Christian era continued up to the first half of this century. This suggests that althrough the nearly two thausand years the population on the settlements was forced to split after reaching to a certain limit and form a new settlement. It was after the Second World War the rapid growth in the population took place due to the health care, and the relief provided by the government and other organizations at the time of famine, flood, drought and epidemics. The nonavailability of the land for the new settlements is resulting in the increase in the size of settlements.

Population of the Ganga-Yamuna Doab

On the basis of the present data we can make rough estimates of the population during different cultural periods for the entire Ganga-Yamuna doab. The total area of the Ganga-Yamuna doab is nearly 69,300 sq. km. By extrapolating the Kanpur data we get the following population figures for different cultural periods : 52,000; PGW 163,000; NBPW 426,000; Early Historic : 900,000. These estimates are only for rural populations because in the absence of a city in the past, in the present area of Kanpur district no estimates for urban population have been made. It may be reasonable to suggest that during the NBPW and Early Historic periods, 10% of the total population lived in 4 cities—Hastinapura,

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Mathurya, Kampila and Kausambi. By adding this 10% we get a total population of 458,000 for the NBPW period and 9,990,000 for the Early Historic period.

Growth Rate of the Population

Population growth rate has recently become a central issue in archaeological models of cultural change (Binford 1968; Boserup 1965; Flannery 1969; Smith 1972; Smith and Young 1972; Young 1972). Carneiro and Hilse (1966) provided an estimate of 0.1% for annual growth rate during the Neolithic period in the Near East on the basis of a guess-estimate of 50,000 persons at the beginning of the Neolithic period and about 1-12 million persons at about 4,000 B.C. The figures indicate a probable growth rate between 0.08 and 0.12% per year. Hassan (1973) used the data obtained by Hole *et al.* (1969) from Deh Luran and arrived at an estimate of the annual growth rate of 0.08% during dry farming and 0.12% during irrigated farming periods. A lower annual growth rate of 0.03% was estimated for the period preceding the Neolithic and 0.23% for the period immediately following the Neolithic (Hassan 1973 : 538). Cowgill (1975), using population data from many parts of the world, concluded that annual growth rates between 0.01 and 0.02 per cent are common for overall regional trends for B.C. and early A.D. periods.

For intensive agricultural societies there have been several estimates. The annual growth rate from the Late Uruk period to the Dynastic period in Southern Mesopotamia has been estimated to be slightly less than 0.5 per cent (Hassan n.d.b; original data from Adams and Nissen 1972). At Ixtapolapa, Mexico (Blanton 1973) two periods of rapid population growth between 1200 B.C. and A.D. 1520 are characterised by an annual growth rate of 0.59 per cent and 0.39 per cent (Hassan 1973). At Kaminaguyu, Guatemala, the annual growth rate from about 800 B.C. to 700 A.D. is thought to have been 0.1 per cent on an average (Hassan 1973).

Of course, these estimates have not been accepted without some valid criticism for their shortcomings (Stephen 1975, Sengel 1973).

On the basis of the total population estimated for Kanpur district for different cultural periods the average annual growth rate from 1350 B.C. to 250 B.C. comes to 0.21 per cent and from 250 B.C. to A.D. 150 it comes to 0.17 per cent. (Fig. 48).

It is interesting to note that the statistically calculated populations from 1350 to 250 B.C. from a base population of 4,646 multiplied by an annual growth rate of 0.21% and the floor area population in 750 and 250 B.C. are in close agreement. The floor area population in 750 B.C. was 14,509 while statistical population was 15,556, a difference of only 1050. In 250 B.C. the floor area population was 37,909 while statistically estimated population comes to 38,524, a

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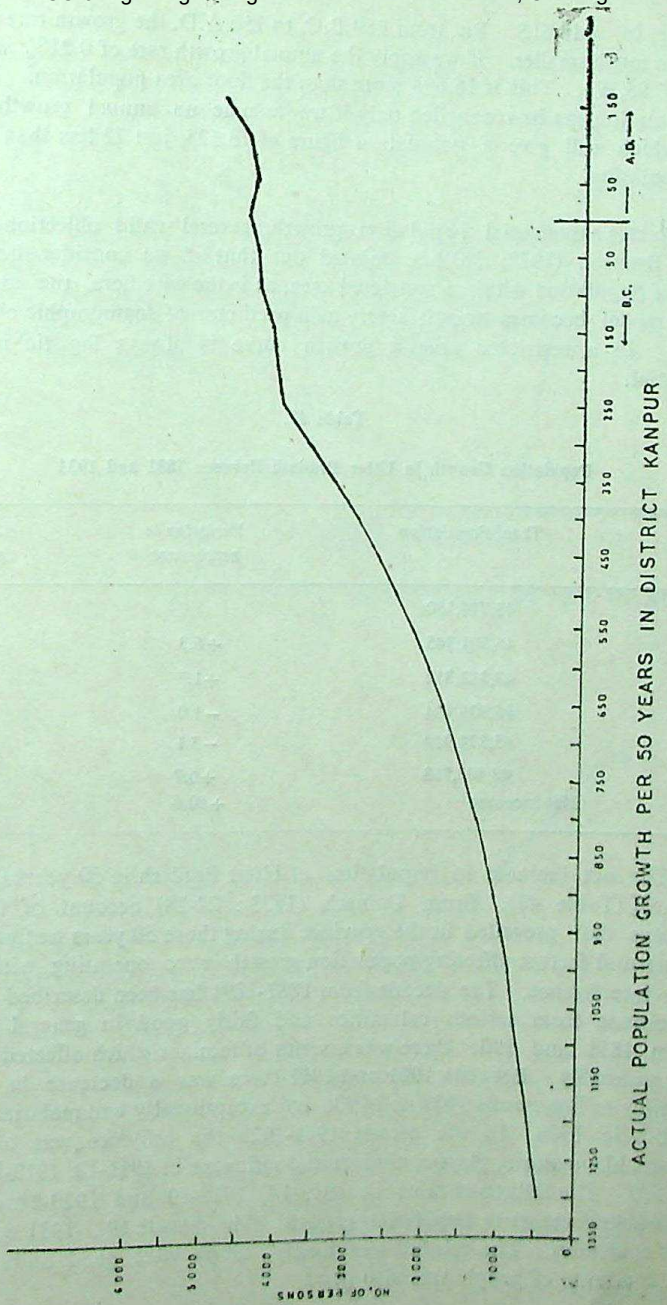

FIG. : 46.

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difference of only 615. But from 250 B.C. to 150 A.D. the growth rate seems to have been much smaller. If we apply the annual growth rate of 0.21% we get a figure of 95,390. This is 16,693 more than the floor area population. The floor area population can be reconciled only if we assume an annual growth rate of 0.17% which will give a population figure of 78,625, just 72 less than the floor area population.

To this exponential population growth, several valid objections can be raised. Bronson (1978: 38) has pointed out that if we consider the probable history of population within a restricted area, as is the case here, the exponential growth model becomes unsatisfactory as a predictor of demographic change and density. In a restricted area a growth curve is always logistic instead of exponential.

Table 47.

Population Growth in Uttar Pradesh Between 1881 and 1931

Year	*Total Population*	*Variation in percentage*	*Density per sq. km.*
1881	43,776,180		412
1891	46,501,345	+6.3	438
1901	47,312,312	+1.7	445
1911	46,806,484	−1.0	441
1921	45,374,939	−3.1	427
1931	48,408,763	+6.7	456
	Net increase	+10.6	

The net increase in population of Uttar Pradesh in 50 years (1881-1931) was 10.6% (Table 47). From Turner's (1933 : 24-28) account of the general conditions that prevailed in the province during those 50 years we find that most of the natural factors affecting population growth were operating without much human interference. The decade from 1881-1891 has been described as prosperous, immune from serious calamities and fairly good in general conditions. Between 1891 and 1901 there was a series of famines which affected the growth rate considerably. Between 1901 and 1911 there was a decrease in population due mainly to famines of 1907 and 1908 and exceptionally bad malaria and plague epidemics in 1908. In the decade 1911-1921 the province was badly hit by epidemics like malaria, plague, cholera and influenza in 1911-12, 1917-18, 1918-19, 1919-1920. The failure of rains in 1913-14, 1918-19 and 1920-21 also caused considerable decrease in population growth. The decade 1921-1931 was free from serious epidemics. The rainfall was timely, crops were good and the general health condition of people was also good.

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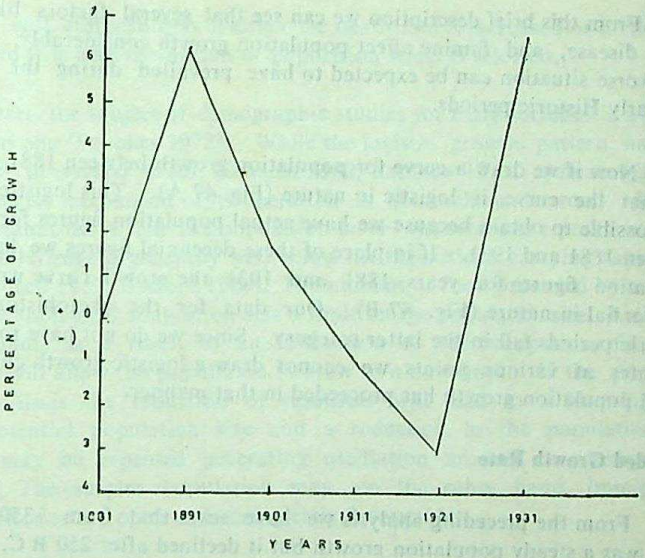
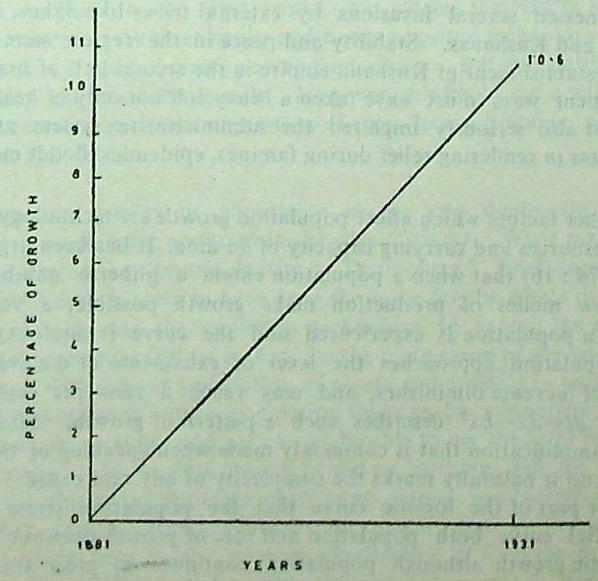
A



POPULATION GROWTH IN UTTAR PRADESH

B



POPULATION GROWTH IN UTTAR PRADESH

FIG. : 47.

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From this brief description we can see that several factors like failure of rains, disease, and famine affect population growth considerably. A similar or even worse situation can be expected to have prevailed during the protohistoric and Early Historic periods.

Now if we draw a curve for population growth between 1881 and 1931 we see that the curve is logistic in nature (Fig. 47 A). This logistic growth curve was possible to obtain because we have actual population figures for each decade between 1881 and 1931. If in place of these decennial figures we had only total population figures for years 1881 and 1931 the growth curve would have been exponential in nature (Fig. 47 B). Our data for the protohistoric and Early Historic periods fall in the latter category. Since we do not have total population estimates at various points we cannot draw a logistic growth curve even if the actual population growth has proceeded in that manner.

Retarded Growth Rate

From the preceding analysis we have seen that from 1350 to 250 B.C. there was a steady population growth but it declined after 250 B C. The reasons for this decline in growth rate may not be possible to explain fully but some speculation can be made. The explanation may lie partly in the break-up of the Mauryan empire after the death of Ashoka. The several smaller states which came into existence were warring with one another. At the same time northern India witnessed several invasions by external tribes like Sakas, Indo-Bactrians, Parthians and Kushanas. Stability and peace in the region were restored only with the establishment of Kushana empire in the second half of first century B.C. The frequent wars must have taken a heavy toll not only of healthy men in the society but also seriously impaired the administrative system and reduced its effectiveness in rendering relief during famines, epidemics, floods etc.

Other factors which affect population growth are technology for exploiting natural resources and carrying capacity of an area. It has been argued (Maynard-Smith 1974 : 16) that when a population enters a hitherto uninhabited area or where new modes of production make growth possible, a very rapid rate of increase in population is experienced and the curve is first exponential. But when population approaches the level of exhaustion of the available resources the rate of increase diminishes, and may reach a zero per cent. The logistic equation $dt=dx-bx^2$ describes such a pattern of growth. This, of course, is a kind of simplification that is commonly made when speaking of the demographic process and it naturally masks the complexity of any real cause. In fact, it is in the upper part of the logistic curve that the population stress arises. In the exponential curve both population and rate of growth continue to increase. In the logistic growth although population continues to grow for a considerable period, it ultimately grows slowly. Renfrew (n.d. : 215) points out that the rate

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of increase will diminish only if either the death rate is increased or birth rate is decreased and it is here the notion of population stress is relevant.

However, the subject of demographic studies for early societies is a difficult and uncertain one (Spooner 1972). While the logistic growth pattern has been demonstrated in several cases (Schacht 1980; Renfrew 1972. Ammerman *et al.* 1976), the precise mechanism of its operation is not well understood. What is fairly well established is that the population level—the saturation point at which the growth stabilizes—is generally well below the theoretical carrying capacity of the area (Birdsell 1957; Binford 1968). The amount of food procured by a specific ecological/technological adaptation sets a limit on the population size. An increase in this amount, as a result of an innovation or the occupation of a pristine environment will allow the population to grow to a new limit. If the population exceeds this limit the reduction of resources will lead to a lowering of the maximum potential population size and a reduction in the population. The mechanism may be repeated generating oscillation around an average population size. The surplus population may, on the other hand, immigrate, if adjacent territories are open and ecologically favourable.

Population Densities

While dealing with the distribution pattern of population in Kanpur district we have seen that during the earlier periods (BRW and PGW) population was mainly confined to the river banks, but during the NBPW period due to increasing pressure on the river banks and newly acquired technology of agriculture, the population started moving away from rivers. But still settlements were located mainly on good fertile soils. However, this could not continue for long and in the succeeding periods colonisation of even less hospitable areas started, mainly in the Y-R doab.

The size and density of population in the two doabs are significantly different. It is much more apparent in the case of rivers. What may have been the factors governing the size and density ? Technology ? Environment ? Social factors ? Social factors seem to have been the same for the whole of the geographical area and so was the available technology to exploit the environment. Therefore, environmental factors seem to be the main cause of the population size and densities. With a given population of plants and animals in an area there is a theoretical maximum of human population that can be supported. One thing is certain that man cannot and may never be able to use the total food potential in the environment. In the first place if he did so, nothing will be left for the future; we see this today at places where some animals are literally eating themselves out of the future. People could do the same. But at the general level what is important here is the relative availability of food resources and land exploitation. The land potential must be the one reason which limited the size and density of population.

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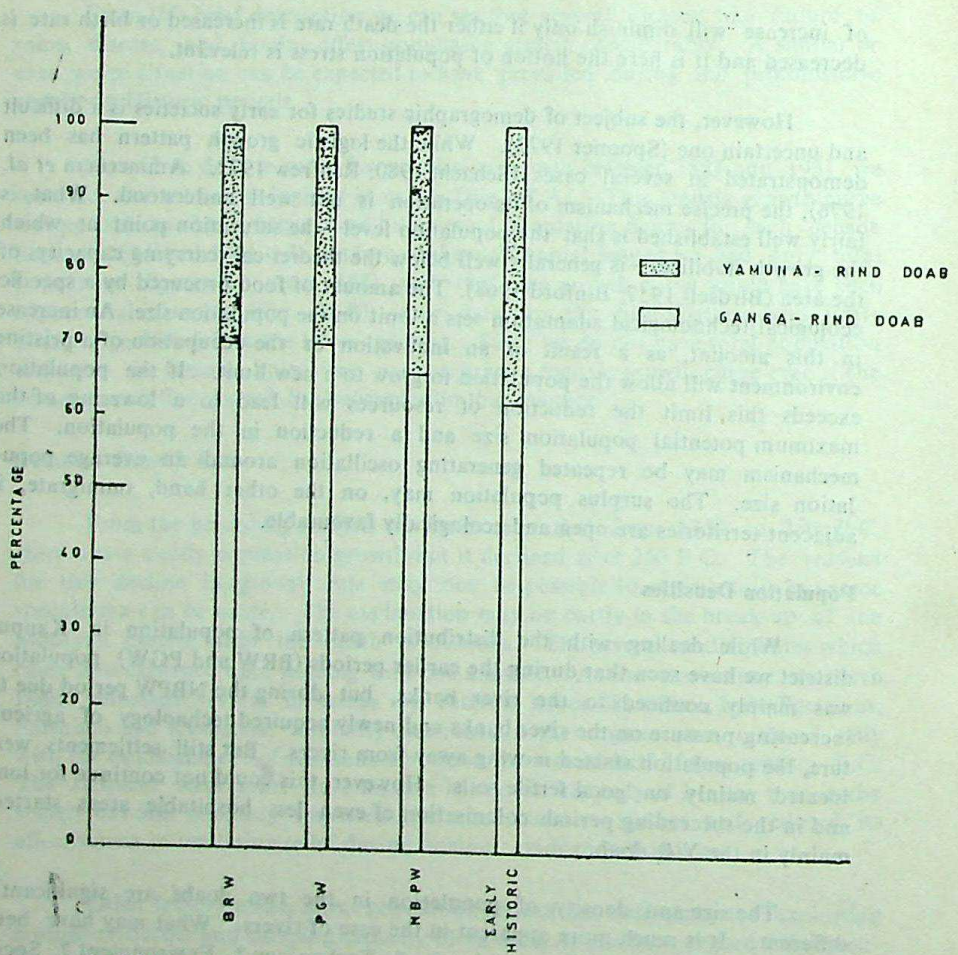

DISTRIBUTION PATTERN OF POPULATION IN DISTRICT KANPUR

FIG. : 48.

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Another factor which seems to have affected the size and density of population is rainfall. Birdsell (1953, 1975) has studied the relationship between rainfall and population densities. He investigated the relationship of 165 tribes with 65 environmental variables. He found that among all the variables, rainfall was one of the best indicators for population density. Areas with higher rainfalls have greater density of population. Martin and Reed (1973) while working with data on African hunter-gatherers obtained similar results. This correlation fits well with Kanpur. Areas of higher rainfall along the Ganga have higher population density while the areas with lower rainfall along the Yamuna and Sengur have lower population density.

The ecological superiority of the G-R doab during the protohistoric and Early Historic periods continues to this day. It is reflected in the present day pattern of population distribution. Table 13 of Chapter IV gives the density of population per sq. km. in different tahsils of Kanpur district. There is higher density in tahsils of Bilhor, Kanpur, Sheorajpur and Narwal which are in the G-R doab than in Derapur and Akabarpur which are in the Y-R doab.

From the changing pattern of population size and density (Table 43, Fig. 48) in Kanpur and so in the G-R and Y-R doabs during different cultural periods we can have some idea of population movement from one area to another.

During the BRW and PGW periods nearly 70% of the total population was living in the G-R doab and only 30% in the Y-R doab. But during the NBPW and Early Historic periods this difference starts to lessen. The difference which was 40% during the BRW and PGW periods comes down to 32% during the NBPW period and to 24% during the Early Historic period. The narrowing gap between the two areas can be attributed only to the migration from the G-R doab. Recently, also, at the time of calamities, famine or due to excessive pressure on the land, people from the G-R doab migrated to the Y-R doab.

Village and Its Catchment Area

Locational analysis is one of the fast developing areas in archaeological studies. Locational analysis can be divided into two main approaches (Hodder and Orton 1976; Hodder 1977; Roper 1979). The first approach leads to the study of man-man relationship in structuring a community ordering on the landscape. The second approach is primarily concerned with man-land relationship in determining site location. Site catchment analysis belongs to this second approach. In the site catchment analysis, sites are conceived as points at the focus of an area throughout which economic activities were performed. Higgs *et al.* (1967) in their study of palaeolithic sites in Epirus, Greece were the first to apply this form of analysis where they tried to interpret the function of Kastritsa site and its position in the advanced palaeolithic system in Greece. C. Vita-Finzi and Eric Higgs (1970) were the first to use the term 'site catchment analysis' and to

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discuss some assumptions and principles underlying this type of analysis in their study of upper palaeolithic and neolithic sites in Palestine. They defined the term site catchment analysis as "the study of relationship between technology and those natural resources lying within economic range of individual sites" (Vita-Finzi and Higgs 1970 : 5). In other words the catchment of an archaeological site is that area from which a site (more properly, the inhabitants of a site) derives its resources. In broad outlines, site catchment analysis delimits a territory or sets of concentric territories surrounding a site and assesses the resource potential contained within that area from which the greatest quantity of resources were derived. The territory exploited from an archaeological site will vary according to a number of factors the most obvious among them being the nature of the economy, the population and the character of the terrain. However, the most important aspect of this exploited territory both in theory and practice is the capacity of the human population to exploit an area effectively.

This effective exploitation concept has another facet. "Further the area is from the site, the less it is likely to be exploited and the less rewarding is its exploitation (unless it is particularly productive) since energy consumed in movement to and from the site will tend to cancel out that derived from the resource. (Vita-Finzi and Higgs 1970 : 7). This assumption is supported by the ethnographic data from Lea (1976) and Jochim's (1976) study for hunting-gathering. Chisolm's study of agricultural exploitation shows that "as the average distance increased, the per hectare returns declined", and it is 'exceptional' for farmers to travel more than 3-4 km. to their fields. (Chisolm 1968 : 43-68, Table 2, p. 50).

The studies of Higgs *et al.* (1968) and Vita-Finzi and Higgs (1970) exemplify two techniques, most commonly used for delimiting the territory to be examined in a site catchment analysis—namely use of circular territories of fixed radii and the use of time contours i.e. walking one hour from an agricultural sites and two hours from a non-agricultural site. Both these methods of delimiting the catchment area have since been widely used (Clarke 1972; Barker 1973, 1975, 1975a; Wibley 1972; Jarman 1976; Rosmann 1979; Zarki 1976; Peebles 1978; Dhavalikar and Possehl 1974).

The method involving circles of fixed radii has been used more commonly, possibly because of the fact that circles are more radially employed when data are taken from available maps rather than collected from the actual walk. To estimate the catchment area from this method, Vita-Finzi and Higgs suggested that one must draw concentric circles with radii 1, 2, 3, 4 and 5 km. around the site, then calculate the area occupied by each type of land. The intensity of exploitation is judged according to the distance. As the distance from the site to the exploitation area increases the intensity of exploitation (in terms of production) decreases. Land within 1 km. is weighted 100% (fully exploited), land between 1 and 2 km. is given 50% weighting and land between 2 and 3 km. 33% weighting and so on (Vita-Finzi and Higgs 1970 : Table 3).

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On the basis of resource analysis and percentage of arable land available within these radii Vita-Finzi and Higgs classified agricultural and non-agricultural settlements. They concluded that the sites whose catchment area had less percentage of arable land were largely non-agricultural while sites with higher percentage of arable land in the catchment area were mainly agricultural. But Flannery (1976 : 93-94) questions these assumptions and suggests that the percentage of arable land in the catchment area is not important. The important factor, according to him is whether the total population of the site could be supported in a small arable area.

In the present analysis of site catchment area, first the population of the site has been estimated and then the yield of arable land. Both of these estimates are of course not very sophisticated due to lack of sufficient data.

It should be mentioned that the present catchment analysis is based on modern or recent resource distributions, since maps of past resource distribution were not available. For a number of reasons including geomorphic change, and drastic changes in resource distribution due to introduction of modern land use practices, present day data may not be very reliable. But these are the types of questions that will always be with us, not merely in site catchment analysis but almost with all facets of archaeology and we have to accept these limitations.

In the present study the site of Radhan has been taken as an example. First the population size of the site has been computed for different cultural periods and then a diet has been suggested which rests on the available archaeological data. The proportion of diet comes from Dhavalikar and Possehl's (1974) work for the site of Inamgaon in the Deccan. From these two pieces of information and average crop yields per hectare it has been possible to estimate the amount of farm land which the settlement at Radhan required for subsistence of its people. There is no doubt that these estimates have several pitfalls but it is hoped that if a limit of requirements is established some picture of subsistence and agricultural pattern will emerge which even though not very sophisticated, will yet have some value.

First the population. The computation method of population and its limitations have already been discussed earlier. The population during the BRW and PGW periods at this site was 1,084, the NBPW period 2, 373 and during the Early Historic period 3,049. These figures are unlikely to be much wide of the mark for a site which was 4 hect. during the BRW and PGW periods, 8.75 hect. during the NBPW and 11.25 hect. during the Early Historic period.

A variety of cultivars have been found in several excavations of protohistoric and early historic sites in the Ganga plains relevant to this discussion. They include rice, barley, wheat, gram, lentils, millet and peas (Kajale 1974; Choudhury *et al.* 1977). Of these wheat, barley and rice must be considered as staple food. In addition cattle, sheep, goat were the source of milk and meat. Hunting and fishing

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also contributed to food supply. Considering the evidence of animal husbandry and horticulture in the traditional literature it can be postulated that milk and vegetables were also an important part of diet.

Dhavalikar and Possehl (1974 : 41) have estimated the diet of an individual as follows :

> "Minimum requirements for long term survival are about 1,700 calories per day taken within a reasonably balanced diet. Good health can be achieved with about 600 calories more. Based on this fact and ethnographic record of somewhat modern comparable cultures the estimate presented here is 2,000 calories. This figure has the advantage of being a mean estimate so that if it misses the mark the resulting distortion would be minimized. The 2,000 calories have been distributed as follows :

All grains	1,350 calories
Vegetables	100 calories
Fruits and sweets	50 calories
Meat (eggs, fish, poultry)	200 calories
Dairy product	300 calories
	2,000 calories

> "If the two estimates, of population and food they ate, are close to actual fact the computation of an area of agricultural land is reasonably easy and secure".

Food Grains and Land Requirements

It seems probable that there would be no spread of cultivation beyond the nucleus site before the evolution of cultivars capable of giving acceptable yield on less fertile and durable soil without seepage. This raises the question as to what is an 'acceptable' yield ? If we are to answer this question and others involving quantitative terms, we must make certain assumptions. Archaeology does not provide us with basic data on yields of early cultivations or on systems of field management, seed rates, consumption and inputs of land labour. The best we can do is to make tentative guesses by analogy with existing or recent communities that are if not similar, near to the early communities (Allen 1972 : 214).

Grains and vegetables are the two features of this diet which would require a significant amount of farm land. For grains (wheat, rice, barley) which are recorded in archaeological excavations as well as in traditional literature[8] yields were computed for ten years from *fasli* 1305-1314 and average was taken from

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the *Gazetteer of Kanpur District* (1929). The averages were combined (Table 48) and weighted for the final figure of 9.0 kg. per acre. Weighting was necessary since it seems unlikely that all the grains were consumed in equal proportion. Barley, wheat, and wheat mixed with barley, peas or gram play an important role in the diet of the people of the doab. Of the total area for three staple crops, barley and wheat (sown separately or mixed) constitute nearly 90 per cent, whereas rice occupies only 10%. Rice is grown in low-lying areas where rain water accumulates. It is seen in the table that the highest rice area in Kanpur district is in Bilhor tahsil which also receives the highest rainfall in the district. But archaeological records show that rice played a more significant role in the dietary pattern of ancient people. We get references in the records of Medieval and early Historic period that the doab had a large rice-growing area and rice formed a major part of the daily diet. The weighting done earlier was based on the percentage of crop area given in Gazetteer. Changing this weighting to 50 per cent of rice, 20 per cent wheat mixed with barley and 10 per cent wheat alone, per acre yield comes to 800 kg. From this estimate of approximate yield per acre, 25 per cent should be deducted for regular seasonal disorders which are very common in the whole of the Ganga plains.

Table 48.

Average of 10 Years (1305-1314 Fasli) Area (in Acres) Under Different Crops

Tahsil	*Wheat alone*	*Wheat mixed*	*Barley*	*Rice*
Akbarpur	8,286	10,470	25,982	5,679
Bilhor	13,770	10,753	26,900	12,840
Pukharayan	3,810	26,322	26,226	5,289
Kanpur	5,660	15,070	25,450	4,213
Derapur	11,481	17,507	30,222	3,605
Narwal	1,270	12,100	23,843	1,570
Sheorajpur	16,026	9,935	26,786	6,521
Ghatampur	704	17,972	27,871	6,180
Total	61,007	1,20,129	2,13,280	45,879
Percentage	13.9	27.3	48.4	10.4

The readjusted yield per acre now comes to 600 kg.

The content of 1 kg. grain is approximately 3,350 calories. Within the diet worked out here, this would feed 2.5 persons for one day. By multiplying this with the population estimate for Radhan, the daily grain requirement comes

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to 434 kg. for the BRW and PGW periods, 950 kg. for the NBPW period and 1,220 kg. for the Early Historic period. Multiplying each of these figures by 365 days gives a yearly requirement of approximately 1,58,410 kg. for the BRW and PGW periods, 3,46,750 kg. for the NBPW period and 4,45,300 kg. for the Early Historic period.

The area required for cultivation can now be calculated from the yield per acre and total grain consumption in one year. This comes to 264 acres for the BRW and PGW periods, 578 acres for the NBPW period, and 742 acres for the Early Historic period. To this estimate something must be added for seeds, spillage, spoil, loss due to rodents and disease and loss in processing. Vegetable crops, millet and pulses will take additional land. A figure of 0.25 acre per person satisfies the grain requirement. If 25% of this figure is added for vegetable crops (0.06 acre), 15% for loss (0.04 acre) and 15% for seeds (0.04 acres) the total land requirment per person comes to about 0.4 acre. By this estimate the total land requirement for the BRW and PGW periods will be 434 acres, NBPW period 950 acres, and Early Historic period 1,220 acres.

However, in this estimate no provision has been made for fallow land. If the land is left dormant every other year it doubles the area required which is 868 acres for the BRW and PGW periods, 1,900 acres for the NBPW period and 2,440 acres for the Early Historic period. And if a fallow period of 2 years is given, then the area required for the BRW and PGW periods will be 1,300 acres, NBPW period 2,850 acres and Early Historic period 3,660 acres. Using these figures we can now postulate that Radhan required an area between 868 and 1,360 acres for the BRW and PGW periods, 1,900 and 2,850 acres for the NBPW period, and 2,440 and 3,660 acres for the Early Historic period.

Before we express these land requirements in terms of radius around the settlement we have to consider one fact. On one side of the settlement is the river Ganga the bed of which is in places more than 3 km. wide. Between the settlement and regular course of the river a land strip of 150 to 300 m. breadth appears along the river after monsoon floods. Thus if we draw a circle around the settlement nearly one-third of it will go in the bed of the Ganga and not more than two-thirds of the total land within the circle will be available for cultivation. Taking this into consideration when we draw the circles around the settlement it comes to 1.3 to 1.6 km. radius for the BRW and PGW periods, 1.9 to 2.4 km. radius for the NBPW period and 2.2 to 2.6 km. for the Early Historic period (Fig. 49)[10]

Now, if we turn to sites on the tributaries and the Yamuna we have to keep in mind that per acre yield in this area will be less due to less fertile soils, and thus a settlement on these rivers will require more acreage to support the same population. This will increase the radius of activity area. When we draw a circle we find that a significant part of it covers the land that is far away from the rivers

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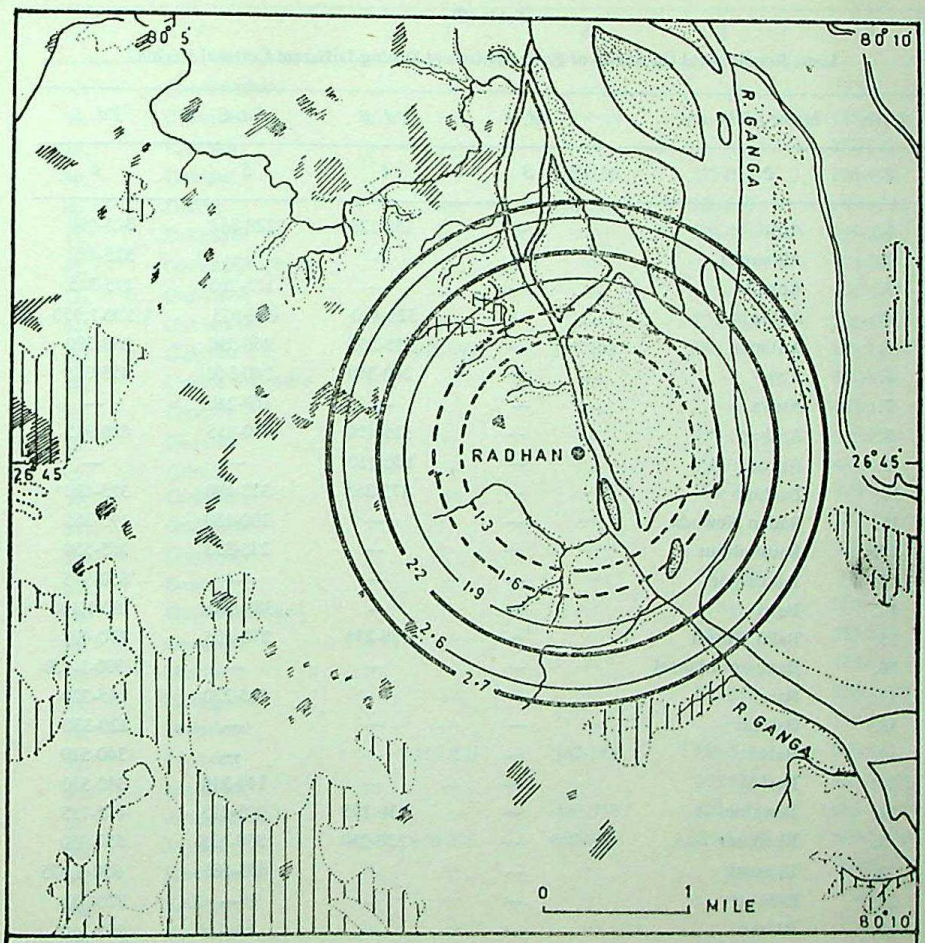

THE SITE OF RADHAN AND ITS CATCHMENT CIRCLES DURING DIFFERENT CUTURAL PERIODS

INDEX

- BRW AND PGW PERIOD
- NBPW PERIOD
- EARLY HISTORIC PERIOD
- WOODED LAND
- LOW LYING LAND
- CULTIVATED LAND

FIG. : 49.

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Table 49.

Land Requirement (in Acres) of Each Settlement During Different Cultural Periods

S. No.	*Name of the site*	*Pd. A*	*Pd. B*	*Pd. C*	*Pd. D*
1	*2*	*3*	*4*	*5*	*6*
1.	Ainti	—	152-228	228-342	325-490
2.	Akbarpur	—	—	—	325-490
3.	Amauli	—	—	175-265	175-265
4.	Ankin	—	325-490	650-975	1,300-1,950
5.	Antapur	—	175-265	260-390	260-390
6.	Atwa	—	240-360	240-360	455-685
7.	Attwa	—	—	160-240	—
8.	Aujhan	—	325-490	610-915	610-915
9.	Auron	—	140-210	—	—
10.	Bachna	—	175-265	325-490	325-490
11.	Badan Newada	—	—	100-150	175-265
12.	Badshahpur	—	—	235-355	365-550
13.	Bahbalpur	—	—	—	650-975
14.	Bairi	—	—	380-570	760-1,140
15.	Balai Khurd	—	156-234	270-405	270-405
16.	Banipara Mahraj	—	—	—	1,300-1,950
17.	Bara	—	—	145-220	145-220
18.	Barauli	—	—	—	220-330
19.	Behta	—	—	—	340-510
20.	Berhat	—	—	140-210	340-510
21.	Bewaine	—	130-195	275-415	475-715
22.	Bhadaras	—	220-230	350-525	650-950
23.	Bhaseni	—	—	455-685	950-1,375
24.	Bhiwan	—	—	—	220-330
25.	Bhisar	—	—	—	105-160
26.	Bhitargaon	—	—	—	650-975
27.	Bihupur	—	—	122-185	260-390
28.	Bijaipur	325-490	325-490	490-735	490-735
29.	Binaur	—	—	—	650-975
30.	Birhar	—	—	285-430	455-685
31.	Biria Derapur-A	—	—	175-265	175-265
32.	Biria Derapur-B	—	—	130-195	130-195
33.	Buhnar	—	150-225	270-405	545-820
34.	Chandanpur	—	—	140-210	140-210
35.	Chandanpur	—	—	300-450	300-450

(Contd. on next page.)

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1	2	3	4	5	6
36.	Charparghata	—	—	—	175-265
37.	Chaurah	—	—	—	425-640
38.	Chilauli	—	—	—	260-390
39.	Debipur	—	175-350	175-350	270-405
40.	Deoha	—	175-350	270-540	870-1,305
41.	Durgapur	—	—	130-260	195-295
42.	Gadanpur Chorsa	—	—	—	175-265
43.	Gahlon-A	—	—	—	75-110
44.	Gahlon-B	—	—	122-185	285-430
45.	Galatha	325-490	325-490	650-975	1,215-1,825
46.	Garhia Sikandra	—	—	—	300-450
47.	Gaupur	—	—	—	105-160
48.	Ghatwa	—	—	175-265	175-265
49.	Gilwat	—	—	490-735	650-975
50.	Gobrauri	—	—	220-330	220-330
51.	Gopalpur	—	—	—	220-330
52.	Guraiya-A	—	—	—	120-180
53.	Guraiya-B	—	—	240-360	240-360
54.	Gurdahi Khurd	—	—	—	380-570
55.	Gurgaon	—	—	155-235	155-235
56.	Hathei	—	—	—	145-220
57.	Hathigaon	—	—	175-265	870-1,305
58.	Hulasipur	—	—	—	175-265
59.	Indayan	162-245	162-245	380-570	650-975
60.	Indurukh	—	—	355-535	735-1,105
61.	Jahangirabad	—	490-735	490-735	1,085-1,630
62.	Jajmau	650-975	650-975	1,085-1,630	1,520-2,280
63.	Kakwan-A	—	—	—	400-600
64.	Kakwan-B	—	—	—	50-75
65.	Kamalpur	—	—	—	310-465
66.	Kamsan	—	—	105-155	105-155
67.	Kamasia	—	410-615	650-975	995-1,495
68.	Karankhera	—	55-80	55-80	—
69.	Karchalipur	—	175-265	515-775	515-775
70.	Karchalipur	—	—	350-525	555-835
71.	Kashipur-A	—	80-120	80-120	—
72.	Kashipur-B	—	—	130-195	130-195
73.	Kashipur-C	—	—	—	215-325
74.	Katka	—	325-490	325-490	325-490
75.	Keilai	—	—	650-975	1,050-1,575

(Contd. on next page.)

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1	2	3	4	5	6
76.	Khajuri	—	—	165-250	165-250
77.	Khalla	—	—	—	215-325
78.	Kheora	195-295	195-295	410-615	695-1,050
79.	Kherakursi	—	650-1,045	1,085-1,630	1,520-2,280
80.	Khirsa	—	—	—	220-330
81.	Karankhera-A	—	—	—	225-340
82.	Karankhera-B	—	—	125-190	125-190
83.	Kishora	—	—	—	220-330
84.	Kismara	—	—	—	385-575
85.	Kurain	—	—	240-580	650-975
86.	Kurtha	—	—	—	270-405
87.	Lala Bhagat	—	—	—	760-1,140
88.	Lamhra	—	115-175	115-175	205-310
89.	Mahraj Nagar	—	—	—	270-405
90.	Mahrajpur	—	—	125-190	425-640
91.	Mahulia	—	—	110-165	110-165
92.	Mandauli	—	—	55-80	260-390
93.	Mathurapur	—	—	—	765-1,145
94.	Mati Kisanpur	—	—	105-155	—
95.	Mawar	—	225-330	325-490	550-775
96.	Milanpur	—	105-155	340-510	450-675
97.	Musanagar	650-975	650-975	1,085-1,630	1,300-1,950
98.	Narainpur	—	—	—	120-180
99.	Nar Khurd	—	—	—	550-775
100.	Nawabgang	325-490	325-490	870-1,305	1,625-2,240
101.	Nibia Khera	—	—	175-265	175-265
102.	Nonha Narsingh	220-330	220-330	280-420	1,140-1,710
103.	Padri Lalpur	—	—	110-165	220-330
104.	Pahewa	—	—	—	220-330
105.	Palahpur	—	220-330	435-650	945-1,420
106.	Panchgawan	—	155-230	220-330	220-330
107.	Panka	—	—	—	80-120
108.	Panki	—	—	—	410-615
109.	Parsaurah	—	—	—	80-120
110.	Pasikhera	—	—	135-200	135-200
111.	Pichora	—	—	—	280-420
112.	Pipergaon	—	—	—	105-155
113.	Pooran Purwa	—	—	270-405	760-1,140
114.	Pura Shukul	—	—	98-150	98-150
115.	Radhan-A	870-1,300	870-1,300	1,900-2,850	2,440-3,660

(*Contd. on next page.*)

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1	2	3	4	5	6
116.	Radhan-B	—	—	—	270-405
117.	Rahimpur Bisdhan	—	95-145	220-330	1,085-1,630
118.	Raipur	—	—	270-405	270-405
119.	Ranipur	—	—	140-210	260-390
120.	Rasdhan	—	—	285-430	570-855
121.	Rasulpur Bhuranda	—	130-195	270-405	410-615
122.	Rataipur	—	—	245-365	245-365
123.	Rataipur	—	—	95-145	220-330
124.	Ratanpur-A	—	125-190	125-190	—
125.	Ratanpur-B	—	—	—	140-260
126.	Reona	—	—	165-245	270-405
127.	Rohini	—	—	140-260	140-260
128.	Sanjeti Badshahpur	—	410-615	554-815	554-815
129.	Sambhalgarh	—	140-210	140-210	—
130.	Salempur Mahera	—	—	—	140-210
131.	Sambhua	—	—	—	245-365
132.	Sandila	—	—	220-340	220-340
133.	Sanihapur	—	310-465	545-815	545-815
134.	Sankim Buzurg	—	—	—	410-615
135.	Sanon	—	—	280-420	280-420
136.	Sapai	—	175-265	175-265	760-1,140
137.	Saraiganj	—	130-195	340-510	340-510
138.	Seng-A	—	—	170-255	170-255
139.	Seng-B	—	105-155	105-155	—
140.	Siddhapur Sheoli	—	340-510	340-510	760-1,140
141.	Terhwa	—	—	—	220-330
142.	Tegaine	—	—	410-615	410-615
143.	Tora-A	—	80-120	80-102	—
144.	Tora-B	—	—	355-500	355-500
145.	Turrayya	—	—	130-195	130-195
146.	Udaipur	—	—	—	870-1,305
147.	Udaipur	—	—	325-490	1,300-1,950
148.	Umran	—	—	260-390	260-390
149.	Uttah	—	105-155	—	450-675
150.	Valmiki Ashram	—	—	260-390	260-390

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and also not very good for agriculture except in extremely controlled conditions. Due to this, the circle further increases to a distance of 3 to 4 km. radius. Obviously, this increases the walking distance and effort from the settlement to the farm land but the return is less. This probably explains the smaller size of settlements on river Rind and Sengur. In other words in environments of low carrying capacity, villages tend to be small communities of a few hundred people so that the exploited area is limited and the crop-lands are not located too far from the homesteads (Allen 1972 : 220).

Farming

In the Ganga-Yamuna doab rice cultivation is done in the low-lying areas of *khadar* tract along the rivers or where rain-water accumulates in upland areas (Misra and Das Gupta 1975: 136). Wheat, and wheat mixed with barley, peas, gram etc. are sown in *khadar* as Well as in *bhangar* areas which retain sfficient moisture after rainy season. Barley is a hard and resistant variety of *rabi* crop, and is often sown in combination with wheat (known as *go-jai*) or gram and peas (known as *berra*). It requires less moisture and thrives well on light soils. It can be grown in low rainfall areas and can tolerate more saline soils than other cereals (Harlan 1972 : 239). Harlan tells us that both archaeological and cuneiform literature agree that wheat had virtually vanished as a crop at Agade by 2300 B.C. at Ur III by 2100 B.C, at Isin/ Larsa by 2000 B.C. and Old Babylonia by 1700 B.C. but these cities were able to survive for a few centuries only because of barley crop.

In the traditional literature we find ample references to irrigation through wells, ponds, canals, dams etc. right from Vedic times (A.A.I., Sharma 1966 : 99-101, Kher 1973 : 165-180). The occurrence of ring wells and ritual votive tanks in the excavations at numerous sites belonging to 600 B.C. to 150 A.D. led many scholars to conclude that if not all, some of the wells and tanks were meant for irrigation purposes (Sharma 1966 : 91, Kher 1973 : 173). During later historic and medieval periods, also, much emphasis was given on irrigation (Habib 1963 : 33-38). In historical literature there are numerous references and incidents to show the concern of the ruler for irrigation facilities. However, from the extensive records of the 19th and early 20th centuries, it does not seem that previous irrigation facilities could have altered the economy of farmers on a large scale. In this context excerpts from Whitcombe's *Agrarian Conditions in Northern India* Vol. 1 would be interesting. She writes :

> "For a successful exploitation of these various conditions one fact was paramount : farmers depended on an adequate and timely rainfall to secure a full out turn on the season's sowing. Unevenness in the rain brought sudden and drastic changes : scarcity could follow abundance within the space of a season. H.B. Webster, the officiating collector of Aligarh noted a common phenomenon of the province when he reported in 1861 how

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three tahsils of his district were transformed by the advent of a favourable rainy season from "a barren, burnt-up desert . . . to richly fertile and productive fields".

"So called irregularity of seasonal imbalance was, however, the norm. Between the two extremes of severe flood and severe drought, climatic conditions fluctuated so considerably from season to season that statistics which claimed to represent an average year were renderd meaningless. Further, within each division—an administrative agglomerate of widely disparate conditions—divergences were often extreme, not only between the districts which made up a division but also between the *parganas* (subdivision of a tahsil) within a district, between *mahals* (revenue estates) within a *pargana* and even between *Mauzas* (village) in a *Mahal.* In 1884, the assistant collector of Muttra noted as a common feature the marked disparity in the circumstances of different properties within a single village owing to the extreme variation in rainfall over so small an area.

"For irrigation, where such was practicable, farmers relied on tanks, streams, *jhils* (the shallow lakes formed by the summer rains in hollow, in the ground), and above all on wells. Where the water table was high and soil ranged from compact to heavy loam, *kachha* or simple earthen wells, lined with thick cable or straw and twigs, could be constructed readily and at little cost for materials . . . . In *bhur* (sandy) tracts of upland areas, where water lay deeper below the surface, *kachha* wells were largely impracticable. Only the more substantial *pakka* wells, lined with cement and demanding a much larger outlay in time and materials, could be constructed. . . . A Majority of the wells—both *pakka* and *kachcha*—were worked by one or less commonly two, pairs of bullocks harnessed to a *churrus*, or leather buckets drawing some fifteen to twenty gallons of water at a time. Where water lay very close to the surface, and particularly in *khadir* or river-valley lands, *dekhlis* or manually operated levers were used to draw the water. The amount of land a farmer could irrigate per day varied according to his source and equipment. The following example from Unao district may be taken as typical of irrigated areas throughout the provinces :

	Measurement (in Biswas) Irrigated per day	
	By pakka well	*By kachcha well*
1. By Manual labour (*dekhlis*)	5-10	2-3
2. By one pair bullocks	8	8

"Irrigation from streams and tanks, where teams of two or four cultivators lifted the water manually in *behri* (shallow baskets) on cards in *guls* (channels leading into the fields), was both inefficient and expensive : a

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relatively smaller area was irrigated with a greater amount of labour expended.

"Prior to the nineteenth century developments in public works, canal irrigation was a rarity even in doab region. The western Jamuna canal, reported to have been dug by Firuz Shah and re-excavated in the mid-seventeenth century by Shajahan was said to have "conferred benefit upon the cultivation of many paraganas and irrigated gardens near the capital (Delhi)," but the proportion of area it may have irrigated relative to that served by wells, let alone to the total cultivated area can safely be regarded as minimal. Colonel Baird Smith estimated that of a total cultivated area throughout the NWP of some 2,40,00,000 acres (approximate area) probably not less than 30,00,000 to 40,00,000 acres were watered by wells. By that date, the canal system in provinces, already vastly superior in extent to the canals of Mughal administration, irrigated an area of barely 10,00,000 acres" (Whitecombe 1972 : 23-31).

Thus, we see that even up to the 19th century canal irrigation was extremely limited and the only effective method for irrigation was wells, the capacity of which was quite limited. It took 4 to 5 days to irrigate one acre of land. Naturally in such a situation it was impossible to irrigate all the cultivated area. Among the staple crops which required irrigation to supplement the insufficient supply of moisture from the light rains of cooler months is only wheat. It seems that wheat was sown in limited area in the vicinity of the settlement and watered by wells. The *kharif* crops must have depended totally on rains while barley was grown in moderate moisture which the soil retained after the rainy season.

Animal Requirement

Excavations at Hastinapura, Allahpura, Atranjikhera, Ahichchatra etc. have yielded a large number of animal bones predominantly of cattle and sheep/goat. Bones of some wild animals, mainly deer, have also been found. Since no systematic study of animal bones has been done, it is not possible to say anything with any degree of certainty.

Notes

1. There are always exceptions to such generalizations. Bylund's (1960) study in Central Lappland in north Sweden shows that good land close to the established settlements and suitable for colonisation may remain unsettled while other localities in remote districts and with inferior soils and poor resources may be colonised.

2. To confirm this observation, exploration of a strip of 15 km. in length and 3 km. in breadth was carried out along the left bank of the Ganga (upstream

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to Bithur) which is mainly the flood plain. Not a single site of any cultural period was found.

3. This is of course, a wide generalization with numerous exceptions. In a hilly tract or a forested area, for instance Himalayan and Satpura tracts, the rainfall is high but density is low. The nature of soils itself affects the question. Finally, it is not only the question of rainfall but also facilities for irrigation. The rainfall directly benefits only the monsoon crops, it is of value to winter crops mostly as increasing the store of water available for agricultural purposes.

4. To estimate the population of the Indus sites, Fairservis (1967) compared the excavated house plans with those of modern villages in the same region and thereby established the mean area of ancient houses. Assuming 6 persons per house and knowing the total floor area he estimated the population at a site.

Frankfort (1950) in his excavations in Mesopotamia found nearly 20 houses in one acre area. With an assumption of 6-10 persons per house he estimated 297 to 494 persons per hectare i.e. 34 to 20 m^2 per person. He also compared his data with contemporary population of Alleppo and Damascus and found that contemporary living population and ancient population estimates were in good agreement. Frankfort's estimate was derived from large, densely settled sites and was intended only to apply to individual example of the same kind. Its inherent deficiencies are multiplied several times if it is applied to an entire region containing types of settlements whose size and architecture are not known and where sites have not been completely surveyed.

Adams (1965) estimated Diyala plains population by taking 3.5 persons per family and 200 persons per hectare. This figure takes into account also the non-residential areas like lanes, gardens and wells, besides public buildings.

Braidwood and Reed (1957) took the size of population that lives now on the mound of Ebril and arrived at an estimate of 526 persons per hectare (19.5 m^2 per person) in the towns. Hole and Flannery (1967) while working in Iran assu ed, without adducing any numerical data in support of their thesis, that all the sites between 1-2 hect. size had on average 100 persons and those of 3-4 hect. size had 200 persons.

5. However, the limitations of archaeological methods have to be kept in mind. The estimates obtained from this analysis are not the final word on this problem. The correlation between site area and population is always tentative. Variation in estimate and other inherent source of errors always remain there. Cook and Heizer (1965, 1968) have shown that in the state of California habitation sites ranging in size from 370 to 9,200 sq.m. may have the same number of 30 persons and at site of 40,000 sq.m. 15 to 300 persons. The reasons for such

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variations are not very clear but it seems that the precise relationship between the surface area of a site and population is related to ecological factors of the area in which the site is found. Somewhat different relationships were obtained for sites in hilly areas, deserts, and coastal environment and for sites in which houses were for single family and those in which multi-family dwelling were common. To sum up, if archaeologists can correlate the population and floor area they can use the formula for other similar sites in the same homogenous environment.

6. Even in the case of excavated sites the problem of precise estimate of population remains unsolved. It is almost impossible to determine whether all the houses in the settlement were occupied at the same time or at different times, and in the same way it is difficult to say whether all the sites plotted on a distribution map of the area were occupied simultaneously or at different times.

7. In deciding family size, besides considering the census data one should keep in mind the biological and demographic principles also. Cook (1972 : 13-14) says "If a population is to maintain itself, each reproductive pair must produce two offsprings who survive to maturity. Hence the absolute minimum family size if the group is not to head for extinction, is four. Under usual circumstances, in order to allow for death in early years each pair must produce at least 3 children. Hence the family size will approach five. If additional numbers are to be allowed, and these average one per family the household reaches close to six. Thus it would be expected that if conditions are normal or nearly so, the number of persons in a nuclear family would range from approximately 4.5 to 6.0. If the admission of a supernumerary number is literal, the value may reach 6.5. Indeed, a household number of 7.0 or above may be taken as *prima facie* evidence for domestic extension. Increase is often produced not by adding distant relatives, but retaining under the same head the older children who do not break off to form a separate household. Depending on how this process is carried, the household size may be double or triple, that of strictly nuclear family. The space requirement will increase correspondingly."

8. It would be relevant here to have a look into the ancient literature for the various crops described in it. Strabo (XV. 1.53), Pliny (XVIII. 13) and *Milinda Panho* describe that rice was chief agricultural produce. Since it was staple food (Macrindle 1877 : 74; *Mahabhasya* 1 : 19) of people in most of the country its cultivation was widely undertaken. In the literature and inscriptions we find references to several varieties of rice. Rice was grown throughout the year and based on the harvesting season rice was classified in four main groups viz. *Graismika*, the summer; *Varshika*, and the rains; *Sarad*, the autumn; and *Haimana*, the winter. The winter crops, wheat and barley were grown almost throughout north India in the upper land. Besides these three crops—rice, wheat and barley—Kher (1973 : 379-400) lists a number of other crops like millets, pulses, oil seeds, timber crops and plants, vegetable, sugarcane etc. described in the literature of pre Christian and early Christian era.

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9. Moorland (1917 : 820; 1918 : 377-8) who examined the price and assessment rates of different crops in the provinces of Awadh, Agra and Delhi given in Ain-E-Akbari, concludes that price as well as value of produce has changed very little since t hen. Among foodgrains only the small millets seem to have yielded more (in terms of exchange with wheat) per acre than now.

10. In this circle determination the yield has not been adjusted according to the distance of farmland from the village. This has not been done because :

1. A fairly conservative estimate per acre of land has been taken.

2. The areas near the settlement may not regularly lie dormant. The fallow period was maybe after three or four years.

3. The areas near the settlement and inundated areas give better yield than the average.

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Conclusion

"The inquiry we have begun in preceding pages, as St. Augustine says of **rythum, nullum, certum habet finem** *'has no fixed stopping place'. The pages themselves, however, must come to an end."*

—Mark Y. Liberman
(1975 : 198)

We can now briefly summarise the main results of the various analyses attempted in the preceding chapters.

The alluvial plains of the Ganga-Yamuna doab are sub-humid and rainfall is between 80-100 cm. The soil is good for cultivation. In the past the doab supported the dense forest flora and a variety of fauna. Because of its fertile land the empires of early period always fought to get the control over the doab.

The Late Harappan and OCP settlements are confined mainly to the higher rainfall zones of the doab. While the Late Harappan settlements are located on the tributaries of the Yamuna only, the OCP settlements extend to the Ganga proper and its tributaries. The isze of settlements during Late Harappan and OCP periods was small (1-2 hect.) and the habitation deposit (1-1.5 m.) shows that the duration of occupation was short. The cultural material, especially pottery types of Late Harappan and OCP show a clear affinity between the two cultures. The structural remains and material culture of the two cultures show an impoverished state of economy. The use of metal (only copper) was very restricted. The OCP and Late Harappan people practiced agriculture and cultivated rice, wheat, barley and gram.

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Copper Hoard sites can be divided into three distinct zones : A—comprising Madhya Pradesh, Bihar, Orissa and West Bengal, B—Uttar Pradesh, and C—Rajasthan and Haryana. The sources of metal for the doab Copper Hoards was probably the copper ores in Garhwal and Kumaon region.

The BRW has an independent status in the doab but the habitation deposit is very little. This may be due to the short duration of occupation or disturbed deposits.

The effective area of PGW culture is much smaller than the area of in which PGW pot sherds are found. PGW settlements were generally located on the river banks and the average spacing between two settlements was 10-14 km. Nearly 95% of the settlements were small, with a size of 1-2 hect. The settlements on the tributaries were smaller than those on the Ganga. In the beginning of the PGW period houses were made of wattle and daub and a thatched roof, but in the late phase sun-dried bricks also came in use. Iron was introduced during PGW period but copper remained the chief metal. PGW people cultivated rice, wheat, barley, gram, pea and *urad*.

During the NBPW period the number of settlements as well as their size increased considerably. On the basis of pottery and structural remains the NBPW period can be divided into three cultural phases. Coins were introduced during this period and the fortified cities with an elaborate drainage system came into being. Iron has become the chief metal and most of the tools and weapons were made of iron. NBPW people cultivated rice, wheat, barley, millet, pea, gram, *urad*, *moong* and *mash*. During this period also the political scene started changing and the big empires emerged for the first time on the Indian soils. The economic activities were more intensified and the external trade began.

In the Early Historic period there was no ceramic industry exclusive to this period. The number of settlements as also their size further increased. The houses were made of mud as well as of sun dried and burnt bricks. They were generally oriented in cardinal directions. A variety of tools and weapons were made in iron. The activities concerning arts and crafts flourished and the overseas trade reached a new height.

At the microlevel, on the basis of landscape, soils, rainfall, temperature and other ecological factors Kanpur district can be divided into two distinct ecological zones—the Ganga-Rind doab and the Yamuna-Rind doab with the river Rind as the boundary line between the two. Ecologically Ganga-Rind doab is better for human settlement than the Yamuna-Rind doab. The population density in the Ganga-Rind doab is much more than in the Yamuna-Rind doab. Also the spacing of settlements in the Ganga-Rind doab is less than in the Yamuna-Rind doab. The present day human setting in the district clearly show that the ecologically less favourable areas are not only occupied last but also very sparsely settled consequently resulting in the low population density per sq. km.

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For the early periods in Kanpur district we see that there has been a gradual increase in the number and size of settlements from Black-and-Red Ware to Early Historic period. Water, soil, rainfall and other ecological factors were the main forces in determining the location of settlements. While the settlements of the BRW and PGW were essentially along the rivers or lakes, with the improved iron technology, the settlements of NBPW and Early Historic periods were also located away from the rivers and lakes. The settlements of the later periods are sometimes located even on the bad land. Numerically, there are many more settlements in the Ganga-Rind doab than in the Yamuna-Rind doab and the spacing between the two settlements in the former zone is less than in the later zone. The settlements are more regularly spaced in the G-R doab than in the Y-R doab where crowding has taken place in some of the ecologically favourable areas. In the less favourable environment settlements show a tendency towards splitting after reaching a size of 2-3 hect. i.e. to a population of 500-600. R Value (ratio of nearest-neighbour) shows that the bigger settlements were located on regular lattice.

The sparseness of settlements on the Yamuna and the Sengur may be explained as due to the bad land topography and the scarcity of other natural resources which results in the low population density even today.

An application of simple model for the population estimate shows that the population density per sq. km. in the G-R doab was more than in the Y-R doab. The former zone was supporting almost the two-thirds of the total population of the district. The growth rate of the population from BRW to NBPW period was nearly the same as that of the Uttar Pradesh during the second half of the 19th century and first quarter of the 20th century. The number of villages in different size categories and the total population living in them indicates that during the Early Historic period there came some estabilization in the ratio of the size and the number of villages and that seem to have continued at least up to the first quarter of 20th century. It was only after the increased population growth rates since 1930s the ratio between the number of settlements and the population living in them changed.

Over all, one of the most important conclusions that emerges from the present study is that in the Ganga-Yamuna doab the pattern of human settlements and population shows a continuity right from the earliest times. The changes that have taken place in this regard are mainly quantitative rather than qualitative.

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APPENDIX I

In the following pages a brief description of each site, its location and the cultural bearings have been given. The sites are arranged alphabetically and their number is the same as that in the figs. 19-21.

Sites

1. Ainti (26°22′ N : 80°10′ E)

Village Ainti is 7 km. south of Sanchadi town and 8 km. S-W of Bhimsen railway station. Close to the river Rind, on its left side there is a mound which measures about 150m. N-S and 100m. E-W. The southern part of the mound measures about 100m. × 70m. The height of the mound in the southern part is 5-6m. and it is slightly more in the northern part. Brick fragments are present on the mound but since not a single complete brick was found it was not possible to get their exact size. PGW sherds are confined to the southern part of the mound while the BSW, NBPW, Red Slipped Ware and Red Ware, both in fine and coarse fabric are found all over the site.

2. Akbarpur (26°23′ N : 79°57′ E)

Akbarpur town is nearly 40 km. S-W of the Kanpur district headquarters. It is also a tahsil and block headquarter of the same name. On the southern fringe of the town lies a mound which measures about 250 m. E-W and 150 m. N-S. It is 5 m. high. The pottery scattered on the mound belongs to the Early Historic and Medieval periods. The major extension of the mound seems to have taken place during the medieval period. The Early Historic pottery is seen only in an area of about 150m. × 100m. on the eastern part of the mound.

3. Amauli (26°5′ N : 80°10′ E)

Village Amauli is 7 km. north of Ghatampur town and 1 km. east of the Kanpur-Hamirpur road. It stands on the right bank of the river Southern Non. Close to the village, right on the river bank, there is a mound which measures

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100 m. N-S and 80 m. E-W. It is 4 m. high. On the mound sherds of the NBPW, BSW, Grey Ware and fine and coarse Red Ware are also found. It seems that after the NBPW period habitation ceased to exist at this site as no pottery or antiquity of a later period is found on the site.

4. Ankin (26°56′ N : 80° 2′ E)

Village Ankin is 2 km. north of the Araul railway station and 12 km. northeast from Bilhor tahsil headquarters. The present village is half a km. away from the Ganga. East of the village and right on the bank of the Ganga there is a large mound. A big nullah cuts across the mound and meets the Ganga. The total length of the mound is nearly 300 m. E-W along the bank and is about 2.50 m. N-S in breadth. It is 10-20 m. high. The western part of the mound which is partly under cultivation is bigger than the eastern part. On the western part of the mound there is a small modern temple built by re-used Mauryan bricks. The size of these bricks is 42 cm. × 27 cm. × 7 cm.

On the mound sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. The sherds of the PGW are confined to a restricted area of only 150 m. × 100 m. on the western part of the mound. The NBPW is spread out in a comparatively wider area of about 200m. × 150 m. i.e. on the whole mound on the western side of the nullah. The sherds of the Red Slipped Ware are found on all over this mound as well as on the mound which is east to the nullah.

5. Antapur (26°24′ N : 78°43′ E)

Village Antapur is 7 km west of Derapur town. One and a half km. N-E of the village, in the ravines, there is a mound right on the bank of the river Sengur. It is 150 m. E-W and 80 m. N-S and is up to 8 m. high. The eastern half of the mound is under cultivation. All over the mound sherds of the NBPW, Red Slipped Ware and Red Ware are found. Sherds of the PGW were found from an area of about 100 m. × 80 m. from the eastern side of the mound. No brick fragments were seen on the mound.

6. Atwa (26°41′ N : 80°14′ E)

Village Atwa is situated 9 km. east of of Sheorajpur and 8 km. N-E of the Chaubepur railway station. The village is on the right bank of the Ganga. Towards the N-E of the village there is a mound which measures about 150 m. × 140m. The height of the mound is up to 10 m. A considerable part of the mound seems to have been washed away by the Ganga.

On the eastern part of the mound the sherds of the PGW and NBPW occur in an area of about 110 m. × 100 m. whereas the sherds of the Red Slipped Ware are found on all over the mound.

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7. Attawa (26°9′ N : 80°17′ E)

Village Attawa is 10 km. east of Ghatampur town and 9 km. N-W of Jahanabad town in Fatehpur district. Close to the village there is a small mound which measures 90 m. E-W and 80 m. N-S. It is 2 m. high. On the mound only the sherds of the BSW, NBPW and Red Ware are found. It seems that after the NBPW period, habitation ceased at this site as no trace of post NBPW culture could be observed.

8. Aujhan (26°36′ N : 80°55′ E)

Village Aujhan is 12 km. north of Rura town and 14 km. S-E of Rasulabad town. Close to the village, on the left bank of the river Rind, there is a mound which measures 225 m. E-W and 125 m. N-S. It is up to 10 m. high. A part of the mound is occupied by the modern village. The whole mound is full of brickbats. The pottery industries represented on the mound comprise the PGW, NBPW, Red Slipped Ware and Red Ware. However, the sherds of PGW are confined only to the eastern part of the mound in an area of about 150 m×100 m. The other wares are found on all over.

9. Auron Tahirpur (26°47′ N : 80°0′ E)

Village Auron Tahirpur is 7 km. S-E of Bilhor town on Bilhor-Kakwan road. From the 7th mile stone of the road the village is 2 km. N-W and a kutcha road leads to the village. About half a km. N-W of the village near a water canal there is a small mound which measures about 80 m.×80 m. Adjacent to the mound there is a big shallow pond which surrounds the mound from the eastern and southern sides. The site is now almost flat due to erosion. On the whole mound sherds of only the PGW and Red Ware are found. The sherds of the bigger pots are rare. This is a single culture site of the PGW.

10. Bachna (26°49′ N : 80°0′ E)

Village Bachna is 8 km. west of Bilhor town and a kutcha road leads to the village. On the western fringe of the village there is a mound which measures 150 m. N-S and 100 m. E-W and is 6 m. high. A part of the mound on eastern side has been cut by the villagers and on the same side some houses of the modern village are also built on the mound. Towards the north of the mound there is a big pond covering an area of about 80 hect.

On the mound sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. The PGW is mainly confined to a smaller area of about 100 m.×80 m. on the eastern side of the mound, whereas other ceramic industries are present all over the mound.

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11. Badan Nawada (26°44′ N : 80°4′ E)

Village Badan Nawada is 3 km. S-W of the Uttri Pura railway station and 10 km. south from Bilhor town. The mound is half a km. north of the village. It measures 90 m.×90 m. and the height is up to 2 m. On the entire mound sherds of the NBPW, BSW, Red Slipped Ware and Red Ware are found. Brick-bats are present on the mound but in very little quantity.

From the surrounding cultivated field the sherds of the NBPW, Red Slipped Ware and Red Ware are found. Close to the mound, towards the southern side, in the fields, a small drain has been cut. In this drain the above mentioned ceramic industries and animal bones can be seen. It appears that originally the mound was much bigger in size. How big it might have been is difficult to say because, due to cultivation, sherds have dispersed considerably.

12. Badshahpur (26°45′ N : 79°54′ E)

Village Badshahpur stands on the right bank of the Ganga, 6 km. S-W of Bilhor town. Close to the village on the southern side there is a mound which measures 120 m.×140 m. It is 6 m. high. Part of the mound on the western side is under cultivation. On the mound sherds of the NBPW, Grey Ware, Red Ware and Red Slipped Ware are found. However, the Red Slipped Ware is found all over the mound whereas the NBPW is confined only to an area of 120 m.×90 m. along the river bank. On the mound brickbats are present. Since not a single complete brick was found, their size could not be known.

13. Bahbalpur (26°27′ N : 79°42′ E)

Village Bahbalpur is 10 km. N-W of Derapur tahsil headquarters, and is on the northern side of the river Sengur. There is a big mound, most of which is occupied by the modern village. In the lanes and other open spaces Early Historic pottery, brickbats and sometimes even intact burnt brick walls are seen. The size of the bricks is 40 cm.×28 cm.×7 cm. It is very difficult to tell the precise size of the mound as it is fully occupied by the modern village but from the antiquities encountered it seems that the maximum extension of the habitation area took place in the late Historic and Medieval period.

14. Bairi (26°32′ N : 80°16′ E)

Village Bairi is 15 km. north of Kanpur and 3 km. east of Kalyanpur railway station and on the left side of Kanpur-Bithur road. Close to the village there is a mound which measures 300 m. N-S and 250 m. E-W. It is up to 7 m. high. A part of the mound is under cultivation. On the mound sherds of the NBPW, BSW, Red Slipped Ware and Red Ware (both in coarse as well as in fine fabric) are found along with the Glazed Ware of the Medieval period. The whole

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moundi s littered with Medieval period. However, the NBPW, BSW and Grey Ware are found only in an area of about 175 m.×100 m. mainly in the central portion of the mound.

15. Balai Khurd (26°23′ N : 79°50′ E)

Village Balai Khurd is 5 km. east of Derapur town and is on the right side of the river Sengur. Between the river and the village there is a mound which measures 125 m.×100 m. It is up to 6 m. high. The eastern part of the mound is considerably eroded. All over the mound sherds of the NBPW, BSW, Grey Ware, Red Ware and Red Slipped Ware are found. Sherds of the PGW were found on the western half of the mound.

16. Banipara Mahraj (26°33′ N : 79°52′ E)

Village Banipara Mahraj is 7 km. N-W of Rura town and 6 km. N-E of the Ambiyapur railway station. To the west of the village there is a big mound which measures about 500 m.×250 m. It is up to 15 m. high. Through the mound a bullock cart track has been cut in which one can see the section exposed. It is a late Historic mound. Only on a small part of the mound sherds of the Red Slipped Ware are found.

17. Bara (26°18′ N : 80° 9′ E)

Village Bara is 15 km. south of Sachendi town and 10 km. S-E of the Paman railway station. The site is on the bank of the river Rind, close to the village. It is a small mound which measures 95 m. N-S and 70 m. E-W. It is up to 3 m. high. All over the mound sherds of the NBPW, BSW, Grey Ware, Red Slipped Ware, Red Ware (both in fine as well as in coarse fabric) are found.

18. Barauli (26°13′ N : 80°8′ E)

Village Barauli is about 7 km. N-W of Ghatampur town. Close to the village, on the left bank of the southern Non there is a small mound, square in shape, measuring 100 m.×100 m. The mound is up to 7 m. high. It is full of brickbats and since not a single complete brick was found their exact size remained unknown. Superficially they bear the characteristics of the Kushana and Gupta period bricks. On the entire mound sherds of only the Red Slipped Ware and Coarse Red Ware are found.

19. Behta (26°42′ N : 80°11′ E)

Village Behta is 4 km. east of the Sheorajpur police station and 8 km. north of the Chaubepur railway station. Close to the village, just on the bank of

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the Ganga there is a mound which measures 150 m. N-S and 105 m. E-W. It is 3 m. high. All over the mound sherds of only the Red Slipped Ware and Coarse Red Ware are found.

20. Berhat (26°35′ N : 80°15′ E)

Village Berhat is 15 km. north of Kanpur city. It is located at about 1 km. west of the Kanpur-Bithur road and 3 km. south of Bithur town. To the S-W of the village, on the bank of a big nullah, there is a mound which measures 125 m. E-W and 120 m. N-S. It is up to 3 m. high. All over the mound sherds of the Red Ware, and Red Slipped Ware are found. Sherds of the NBPW, BSW, and Grey Ware are found in an area of about 80 m.×80 m. on the northern side of the mound. Full size bricks were also found which fall into two categories : 45 cm.×23 cm.×8 cm. and 30 cm.×18 cm.×5 cm.

21. Bewaine (26°28′ N : 79°56′ E)

Village Bewaine is 3 km. south of the Maitha railway station and is on the right side of the river Rind. Close to the village, on the bank of the Rind, there is a mound which measures 175 m. E-W and 125 m. N-S. It is up to 10 m. high. A portion of the mound on the southern side has been cut and flattened and another part is under cultivation.

Spread over the entire mound are the sherds of the NBPW, BSW, Grey Ware and Red Slipped Ware. The sherds of the PGW are found only on the eastern side of the mound in an area of about 100 m.×60 m.

22. Bhadras (26°10′ N : 80°10′ E)

Village Bhadras is 2 km. north of Ghatampur town and 1 km. west from Kanpur-Hamirpur road. Close to the village, on the western side there is a mound which measures 200 m. N-S and 150 m. E-W. It is up to 5. m. high. On the eastern part of the mound there is a modern temple and the western and southern sides are under cultivation. On the northern and eastern side of the mound there is a large low-lying swampy area like that of Jahangirabad. During the rainy season this area takes the shape of a lake, otherwise water is confined to a big pond on the eastern side of the mound.

On the southern half of the mound the PGW occurs in an area of nearly 100 m.×100 m. The area of the NBPW measures 160 m.×100 m. The sherds of Red Ware and Red Slipped Ware are found all over the mound. Brickbats are found on the mound but in the absence of a complete brick it was not possible to know their size.

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23. Bhaseni (26°43′ N : 80°10′ E)

Village Bhaseni is nearly 3 km. N-W of the Sheorajpur police station and 40 km. N-E of Kanpur. About half a km. east of the village there is a mound just on the right bank of the Ganga. At present the mound measures about 230 m. E-W and 190 m. N-S. It is up to 6 m. high. Towards the bed of the river, a complete profile of the mound is exposed. Attached to the open section, several structures are visible of which the most prominent is a complete well lined with the burnt bricks of Kushana period. Several wall structures are also exposed. The walls and the well are made of the same size bricks.

Due to erosion the mound has been cut into several parts. All over the mound sherds of the Red Slipped Ware and Red Ware are found. The NBPW is found only in an area of about 175 m.×140 m. towards the eastern part of the mound.

24. Bhiwan (26°35′ N : 80°45′ E)

Village Bhiwan is 5 km. west from the Sheoli police station, on Sheoli-Belapur road. Close to the village on the western side there is a mound which measures 125 m. E-W and 80 m. N-S and is about 15 m. high. All over the mound sherds of only the Red Slipped Ware and Coarse Red Ware are found.

25. Bhisar (26°26′ N : 80°8′ E)

Village Bhisar is 2 km. west of Sachandi and 6 km. south of the Bhaupur railway station. Nearly 1.5 km. east of the village there is a small mound which measures 80 m.×60 m. It is up to 5 m. high. On the entire mound sherds of the Red Slipped and Coarse Red Ware are found. Only 6 sherds of the BSW were found.

26. Bhitargaon (26°12′ N : 80°16′ E)

Village Bhitargaon stands on the road from Narwal to Ghatampur, 11 km. beyond Sarh and 5 km. west from the Rind. East to the village there is a big mound. This was cultivated for years and has disturbed the site and spread its contents to such an extent that the exact size of the mound could not be determined. It has only been roughly estimated that originally the mound was 200 m. E-W and 150 m. N-S.

The Narwal-Ghatampur road has cut the mound on the western side. In the section thus exposed sherds of only the Red Slipped and Coarse Red Ware are found. On the surface also only these two types of ceramic industries are represented.

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27. Bihupur (26°8′ N : 80°16′ E)

Village Bihupur is 10 km. east of Ghatampur town and 6 km. south of Bhitargaon. Towards the north of the village there is a large depression which takes the shape of a lake during the rainy season. In the village there is a mound which measures 120 m. × 100 m. It is up to 6 m. high. A part of the mound is inhabited by the modern village. Brickbats are present on the mound and a few complete bricks measure 39 cm. × 28 cm. × 12 cm. The ceramic industries represented on the mound are the NBPW, BSW, Red Ware and Red Slipped Ware. The NBPW occurs only in the middle part of the mound in an area of about 75 m. × 75 m.

28. Bijaipur (26°15′ N : 79°58′ E)

The mound of the village Bijaipur stands on the left bank of the river Sengur, opposite to the village Malasa which is 4 km. south of the Malasa railway station. The mound is 200 m. in length along the river and 150 m. in breadth. It is difficult to estimate the exact height of the mound because of the badly dissected land around. On the entire mound ceramic industries represented are the BRW, PGW, NBPW, Red Slipped Ware and Red Ware.

29. Binaur (26°23′ N : 80°9′ E)

Village Binaur is 4 km. south of Sachandi and 20 km. S-W of Kanpur City. There is a big mound in the village. It measures nearly 250 m. N-S and 200 m. E-W. The total mound is occupied by the modern village. The main ceramic industries found at open places are the Red Ware and Red Slipped Ware.

30. Birhar (26°10′ N : 80°20′ E)

Village Birhar is 8 km. S-E of Bhitargaon and 7 km. north of Jahanabad town in Fatehpur district. It is about 1.5 km. west of the river Rind. On the northern side of the village and just on the right bank of the Rind there is a mound which measures 190 m. N-S and 140 m. E-W. It is up to 8 m. high. A part of the mound is under cultivation. Brickbats are present all over the mound but since not a single complete brick was found its size could not be known. The ceramic industries represented on the mound are the NBPW, BSW, Grey Ware, Red Slipped Ware and Red Ware. The area of the NBPW distribution is only 120 m. × 100 m. from the northern side.

31. Biria Derapur-A (26°25′ N : 79°45′ E)

Village Biria Derapur is about 2.5 km. S-E of Derapur town. It is on the right bank of the river Sengur. Close to the village, on the eastern side there is a small mound which is 100 m. N-S and 80 m. E-W. It is up to 8 m. high. A

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part of the mound is under cultivation. All over the mound sherds of the NBPW, Red Slipped Ware and Red Ware are found.

32. Biria Derapur-B (26°25′ N : 79°45′ E)

Opposite to the above mound across the river Sengur there is a mound on the left bank of the river. It is a small mound measuring 80 m. N-S and 75 m. E-W and is about 3 m. high. The sherds of the NBPW, Red Slipped Ware and Red Ware are found all over.

33. Buhnar (26°53′ N : 80°6′ E)

Village Buhnar is 5 km. N-E of Bilhor town and 8 km. S-E of the Araul railway station. It is located right on the left bank of the Ganga. The Small village of about 30 houses is situated on the ancient mound itself which measures 250 m. E-W and 100 m. N-S. It is up to 8 m. high. The habitational deposit that can be seen in the profile towards the Ganga bed is 4.5 to 5.0 m. According to the local people nearly one-third of the mound has been washed away by the Ganga. There is a heavy deposit of mud over the debris so the pottery or any other antiquities are not much exposed. But still some observations could be made because of a bullock cart track that cuts across the whole length of the mound of the southern side. From the western end of the mound to a length of about 100 m. sherds of the PGW, NBPW, Red Ware are found along with Red Slipped Ware. The NBPW, and Red Ware are found along with Red Slipped Ware. The NBPW sherds are found up to about 125 m. from the western end. But as we proceed east from this point onwards till the end of the mound we find only the Red Slipped and coarse Red Ware.

34. Chandanpur (26°9′ N : 79°58′ E)

Village Chandanpur is 10 km. east of Ghatampur town on the Ghatampur-Jahanabad road. Close to the village there is a mound which measures 80 m. E-W and 80 m. N-S. It is up to 4 m. high. A part of the mound is under cultivation. All over the mound sherds of the NBPW, BSW, Red Slipped Ware and Coarse Red Ware are found.

35. Chandanpur (26°30′ N : 80°16′ E)

Village Chandanpur stands on the left bank of the river Yamuna. It is 3 km. east of Musanagar town and 6 km. downstream from the confluence of the Yamuna and the Sengur. Just on the bank of the river there is a mound which measures 125 m. in length along the Yamuna and 110 m. in breadth. It is up to 5 m. high. Part of the mound is occupied by the modern village. Ceramic industries represented on the mound are the NBPW, BSW, Red Ware and Red Slipped Ware. Brickbats are very rare.

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36. Chaparghata (26°10′ N : 79°56′ E)

Village Chaparghata stands on the right bank of Sengur and is 4 km. west of Musanagar town on the Mughal road. On the western side of the village there is a mound which measures about 100×80 m. It is 6 m high. A part of the mound is occupied by the modern village. This mound is of the Early Historic Period. The ceramic industries present on the mound are Red Slipped Ware and Coarse Red Ware.

37. Chaurah (26°10′ N : 79°47′ E)

Village Chaurah is towards the western side of the Chaurah railway station and 70 km. from Kanpur. To the N-W of the village, on the banks of the Yamuna there is a mound which measures 150 m. E-W and 130 m. N-S. The land all around is very dissected so it is difficult to estimate the height. The habitational deposit seen in the sections cut due to the rain gullies is up to 5 m. from the top surfaces of the mound. On the mound 3 small plinths have been made on which villagers keep the terracotta and icons found on the mound. The whole mound is littered with the Coarse Red Ware and Red Slipped Ware. Brickbats are also found all over the mound. The size of the brick is 38 cm.× 26.5 cm.×7.5 cm.

38. Chilauli (26°28′ N : 79°52′ E)

Village Chilauli is 5 km. S-W of Rura town and 8 km. N-E of Derapur on the Derapur-Rura road. Close to the village on the southern side lies a mound which measures 120 m.×100 m. It is up to 14 m. high. The whole mound is littered with brickbats of the Gupta period and medieval period. All over the mound sherds of Red Slipped Ware and Coarse Red Ware are found along with Medieval Glazed Ware.

39. Debipur (26°20′ N : 80°30′ E)

Village Debipur is on the right bank of the Ganga, 7 km. east of Sarsol town and 21 km. S-E of Kanpur. Close to the village towards the north-eastern side there is a mound which measures 100 m. E-W and 125 m. N-S. It is up to 5 m. high. The eastern part of the mound has suffered some erosion. Almost in the centre of the mound there is a modern Siva temple. The ceramic industries seen on the mound are the PGW, NBPW, BSW, Grey Ware, Red Slipped Ware and Red Ware. However, the PGW and NBP are confined to a small area of 100×80 m. whereas the Red Slipped Ware and Coarse Red Ware are found all over the mound. A few wall structures built with Mauryan period bricks can be seen in the profile open towards the Ganga.

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40. Deoha (26°52 N : 80°0′ E)

Village Deoha is 8 km. N-W of Bilhor town and 8 km. S-W of the Araul railway station. The river Isan is about 1.5 km. east of the village. The mound is on the south-western side of the village and a part of it is occupied by a modern village. It is an oval shaped mound measuring 200 m. E-W and 200 m. N-S. It is up to 8 m. high. On the southern and western part of the mound sherds of the PGW, NBPW, BSW and Red Ware could be noticed. Almost in the middle of the mound a cart-road has been cut and sections are open on both the sides. In the sections no sherds of the PGW or NBPW was found. It appears that the maximum occupation area at this site belongs to the Early Historic period represented by the Red Slipped Ware. The area in which the PGW is found measures about 100 m.×80 m. whereas the NBPW area is bigger.

41. Durgapur (26°42′ N : 80°11′ E)

Village Durgapur is 5 km. east of the Sheorajpur police station and 7 km. north of the Chaubepur railway station. The site of Durgapur is just 1 km. south-east of the site of Behta. The site is east to the modern village and is on the Ganga bank. According to the villagers nearly half of the mound has been washed away by the Ganga in the last 50 years. The remaining part of the mound itself looks like the tail-end of some big mound. At present this mound measures 150 m. E-W along the Ganga and 60 m. N-S. The height of the mound is up to 12 m. The thickness of the habitational deposits, which can be seen in the profile open towards the river side, is about 6 m.

All over the mound sherds of the Red Slipped Ware and Coarse Red Ware are found. The sherds of the NBPW, BSW and Grey Ware along with fine Red Ware are confined only to an area of 100 m.×60 m. from the southern side of the mound.

42. Gadanpur Chorsa (26°46′ N : 80°1′ E)

Village Gadanpur Chorsa is 5 km. N-W of Uttri Pura railway station and 9 km. S-W of Bilhor town. The total mound is occupied by the modern village. It is difficult to estimate the exact size of the mound. Probably the size was 100 m.×80 m. Besides Early Historic ceramic industries, only 3 sherds of the NBPW were found in the open area of the mound.

43. Gahlon-A (26°32′ N : 79°58′ E)

Village Gahlon is 6 km. N-E Rura town and 11 km. S-W from the Sheoli Police station. Within the vill e revenue area there are two mounds : The mound, Gahlon-A, is on the southern ide of village and measures 75 m. ×50 m.

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It is 5 m. high. The mound is littered with brickbats. The ceramic industries represented on the mound are the Red Slipped Ware and Coarse Red Ware.

44. Gahlon-B (26°32′ N : 79°58′ E)

The mound is towards the north-east of the village and measures 175 m. E-W and 75 m. N-S. It is up to 7 m. high. All over the mound sherds of the Red Slipped Ware and Coarse Red Ware are found. The NBPW and BSW are present only on one-third part of the mound towards the western side. Brickbats are present on all over the mound but the full size of bricks could not be known because not a single complete brick was found.

45. Galatha (26°13′ N : 80°17′ E)

Village Galatha is 45 km. S-W of Kanpur and 5 km. N-E of the Aung railway station. It is just on the border between Kanpur and Fatehpur districts. Close to the village, just on the bank of the Ganga there is a mound. Part of the mound on the western side is occupied by the modern village and a part of it on eastern side is under cultivation. The total length of the mound is 500 m. along the river and the breadth is 300 m. It is up to 12 m. high. On the mound sherds of the BRW, PGW, NBPW, BSW, Grey Ware, Red Slipped Ware and Red Ware are found, along with Glazed Ware of the medieval period. The bricks of Mauryan, Kushana, Gupta and medieval periods are also found.

It seems that the maximum development of the mound took place in medieval period. The BRW, PGW, and NBPW are found in an area of about 150 m.×130 m., almost in the middle of the mound. The distribution of the Red Slipped Ware is in an area of about 240 m.×180 m.

46. Garhia Sikandara (26°26′ N : 79°48′ E)

Village Garhia Sikandara is 5 km. west from Derapur town and is located on the southern side of the river Sengur. Close to the village on the eastern side there lies a mound which measures 125 m.×110 m. It is up to 6 m. high. The ceramic industries represented on the mound are the Red Slipped Ware and Coarse Red Ware. A few complete bricks found on the mound measure 40 cm.× 28 cm.× 8 cm.

47. Gaupur (26°36′ N : 79°47′ E)

Village Gaupur is 8 km. N-E of the Jhinjak railway station and 8 km. south of Rasulabad town. Near the village on the N-E side there is a small mound which, at present, measures 80 m.×60 m. It is 6 m. high. A part of the mound has been cut flat and converted into cultivation fields. Therefore, it is not possible to determine the exact size of the mound. On the mound the sherds

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of the Red Slipped Ware and Coarse Red Ware, mainly, are found. Only a few sherds of the BSW were found.

48. Ghatwa. (26°12′ N : 80°8′ E)

Village Ghatwa stands on the left bank of the river southern Non, aud is 6 km. N-W of Ghatampur town. Close to the village on the northern side, along the left bank of the river there is a mound which measures 100 m. in length and 80 m. in breadth. It is about 3 m. high. All over the mound sherds of the NBPW, BSW, Red Slipped Ware and Red Ware are found. The whole mound is full of brickbats. A few complete bricks available measure 42 cm.×27 cm.×7 cm.

49. Gilwat (26°55′ N : 80°3′ E)

Village Gilwat is 8 km. north of Bilhor town and 3 km. east of Araul railway station. The site of Gilwat is right on the southern bank of the Ganga, about half-a-km. north of the village. The mound which measures 200 m. E-W and 150 m. N-S and is 8 m. high has not suffered any erosion by the river. On the mound sherds of the NBPW, BSW, Red Slipped Ware and Red Ware are found. Due to a heavy mud cover over the site, the distribution pattern of different ceramic types could not be well observed. It seems that the habitation of the NBPW period was about 150 m.×125 m. whereas during the Red Slipped Ware it was all over the mound.

50. Gobrauri (26°14′ N : 80°18′ E)

Village Gobrauri is about 4 km. N-E of Bhitargaon across the river Rind. On the right bank of the river there is a mound which measures about 100 m.× 100 m. It is 5 m. high. A part of the mound seems to have been washed away by the river.

All over the mound sherds of the NBPW, Red Slipped Ware and Red Ware both in fine as well as coarse fabric are found. In the profile open towards the river the total habitation debris is about 2 m. It seems that habitation did not continue on the site for a long time. Any brick structure is not in the profile, nor are any brick-bats on the site.

51. Gopalpur (26°27′ N : 80°11′ E)

Village Gopalpur is 3 km. S-E of Ghatampur town and 1.5 km. east of the Gopalpur railway station. Close to the village towards roadside there is a square mound measuring 100 m.×100 m. It is nearly 4 m. high. The whole mound is full of brickbats. The ceramic industries represented on the mound are the Red Slipped Ware, and Red Ware in fine and coarse fabric. No sherds of the NBPW or BSW were found on the site.

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52. Guraiya-A (26°39′ N : 80°13′ E)

Village Guraiya is 3 km. north of the Chaubepur railway station. Close to the village towards the S-W side there is a small square mound measuring 75 m. × 75 m. Its height is about 8 m. The pottery found here is mainly the Red Slipped Ware and Red Ware. It is purely a mound of the Early Historic period.

53. Guraiya-B (26°39′ N : 80°13′ E)

To the west of the above site there is a flat mound which measures about 110 m. × 100 m. The total mound is under cultivation. On the whole, mound sherds of the NBPW, fine Red Ware and Black Ware are found. It seems that, after the NBPW period, habitation did not continue on this site.

54. Gurdahikhurd (26°21′ N : 79°36′ E)

Village Gurdahikhurd is 3 km. west from Sikandara town. Nearly 1 km. N-W of village there is a mound which measures 140 m. E-W and 125 m. N-S and appears oval in shape. The mound is 6 m. high. Except on the northern side the mound is surrounded by a large depression which takes the shape of a wide nullah towards the south of the mound. This nullah ends in the Yamuna. At places, in this nullah ponds have been found which retain water throughout the year and the nullah is cultivated for winter crops.

The ceramic industries represented on the mound are the Red Slipped Ware and Coarse Red Ware. All over the mound brickbats are present and a few complete bricks measure 42 cm. × 28 cm. × 7 cm.

55. Gurgaon (26°27′ N : 80°5′ E)

Village Gurgaon is 4 km. S-W of the Bhaupur railway station and 6 km. from the Maitha railway station. The village is near the left bank of the Rind. Close to the village there is a mound which measures 90 m. E-W and 80 m. N-S. It is about 8 m. high. The whole mound is littered with the NBPW, BSW, fine Red Ware, Red Slipped Ware and Coarse Red Ware. Medieval Glazed Ware is also found at the site.

56. Hathei (26°15′ N : 80°5′ E)

Village Hathei is 14 km. N-E of Ghatampur town and 11 km. north from the Paman Railway station. From the eastern, northern and western side the village is surrounded by low-lying swampy area which takes the shape of a lake during rainy season.

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In the village there is a mound, part of which is occupied. It is a post-NBPW mound. On the mound the sherds of the Red Slipped Ware and Coarse Red Ware are found. A few complete bricks found at the site measure 43 cm.× 27.5 cm.×8 cm. The size of the mound is 90 m.×75 m. and it is about 8 m. high.

57. Hathigaon (26°16′ N : 80°28′ E)

Village Hathigaon is 3 km. N-E of Narwal town. About half-a-km. north of the village there is a big mound, almost square in shape measuring 200 m.× 200 m. It is nearly 10 m. high. On the whole mound sherds of the Red Slipped Ware and Coarse Red Ware are found. On the northern part of the mound, in an area of about 100 m.×80 m., sherds of the NBPW, BSW, Grey Ware and fine Red Ware were also found. Brickbats are present on the mound in large quantity.

58. Hulasipur (26°26′ N : 80°8′ E)

Village Hulasipur is about 3 km. west of Sanchendi and 6 km. south of the Maitha railway station. Close to the village there is a mound which measures 100 m.×80 m. It is about 4 m. high. This mound is of the early historic period. The pottery found on the mound are the Red Slipped Ware and Coarse Red Ware. Brickbats are present on the mound.

59. Indayan (26°30′ N : 79°57′ E)

Village Indayan is 5 km. N-E of Rura town and 15 km. of S-W of the Sheoli police station. The village is on the right side of the river Rind. On the eastern side of the village there is a mound just on the bank of the Rind. It measures 200 m. E-W along the river and 150 m. N-S. The maximum height of the mound is nearly 10 m. Nearly half of the mound towards the river-side is under cultivation.

From the slope of the mound towards the river-side, sherds of the BRW, PGW and NBPW were recovered along with Red Ware and Red Slipped Ware. These types are distributed only over half of the breadth of the mound towards the river side, i.e., western side. The eastern half of the mound seems to have expanded during early historic period. On this part of the mound the brick-bats are scattered profusely. The main ceramic industry present on this part is the Red Slipped Ware along with coarse Red Ware.

60. Indurkh (26°24′ N : 79°52′ E)

Village Indurkh is about 7 km. N-E of Derapur and 10 km. west of Akbarpur towns. It is 1 km. north of the river Sengur. Close to the village on the western side there lies a big mound which measures 200 m. E-W and 170 m.

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N-S. It is about 12 m. high. About one-third of the area on the northern side of the mound is occupied by the modern village and a part of it on the western side is under cultivation. One can see the re-used Mauryan bricks in modern houses. From the open part of the mound, sherds of the NBPW, BSW, Red Ware and Red Slipped Ware are found. A few sherds of fine Grey Ware were also found on the eastern side of the mound which is under cultivation.

61. Jahangirabad (26°12′ N : 80°11′ E)

Village Jahangirabad is 5 km. north of Ghatampur town and 37 km. S-W of Kanpur. It stands on the Kanpur-Hamirpur road. In the village there is a mound which measures 300 m. E-W and 200 m. N-S. It is 8 m. high. The Kanpur-Hamirpur road cuts the eastern part of the mound and an area of about 75 m.×60 m. has been separated from the main mound. Besides, on the western side several houses have been constructed after levelling the mound. In this process, sherds of the PGW, NBPW, Grey Ware, Red Slipped Ware and Red Ware can be seen. From the surface distribution of pottery it appears that during the PGW and NBPW periods the habitation area was not bigger than 150 m.×150 m. Except on a part of the mound across the road, mainly sherds of the Red Slipped Ware and Coarse Red Ware are found. The part of the mound across the road is of the Medieval period.

On the N-W of the mound there is a large lake covering an area of about 5 sq. km. (Pl. II A). During the rainy season the whole lake is full of water but after the rainy season water remains only in the middle of the lake in an area of about 0.5 sq. km. The rest of the lake area is under cultivation for winter crops.

62. Jajmau

The ancient town of Jajmau formerly gave its name to the Kanpur tahsil but is now decayed, standing on the right bank of the Ganga and to the east of the Kanpur Cantonment, about 6 km. from the city. Traditions state that the ancient name was Siddhapura, and at some distance to the east of Jajmau, still, there are temples of Siddheswar and Siddha Devi, on the river banks together with *ghats*. The name Jajmau is, however, very old and the place is mentioned by the geographer Albaruni. The high mound overhanging the river is supposed to have been the fort of Raja Chandravarma, the Chandal king, and the capital kingdom of Jajati, whence is derived the name Jajmau. The mound is vast in dimension being about 1.5 km. in length and 350 m. in breadth. It drops sharply, on the land-side, to the general level of the country while, on the river-front, is a cliff of 20 m. or more in height.

The mound was explored in 1962 and antiquities dating back from the Painted Grey Ware period to medieval period were found. Considering the

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potentialities of the site, excavations were taken up at the site from 1970-1974 (*IAR* 1973-74 to 1975-76). This is the only site excavated in the district of Kanpur. The excavation revealed four periods of cultural occupation. They are as follows :

Period I

The period I is represented by the occurrence of the PGW and BRW along with the Red Ware of fine to medium fabric. Since the area of excavation was very small no other antiquities were found.

Period II

The Period II is represented by the occurrence of the NBPW and its associated wares. Besides the pottery, terracotta sealings, mostly bearing legends in Brahmi script, terracotta figurines of human and animals, disc and flesh rubbers, vase-shaped terracotta beads, fish-hooks, fragmentary rings, nails, arrow-heads and spear-heads of iron, beads and pendants of carnelian, glass, crystal, agate, bones, ivory and terracotta bangles were also found. Structural activities with burnt bricks are also noticed. The bricks measure 48 cm.×28 cm. ×7 cm. Two walls running parallel, with a space in between 2.2 m., were exposed up to 9 m. The space in-between the walls is separated by a brick wall at an interval of 2.8 m.

Period III

The period III is represented by the Red Slipped Ware and Red Ware of fine to medium fabric. Shapes found are mainly inkpot type lids, bottle-neck sprinklers, bowls with inturned rim and flat base, spouted vessels, and various types and sizes of jars. The antiquities found were terracotta human and animal figurines, lids of stone casket, iron arrowheads, antimony rods, copper coins, terracotta sealings, ivory bracelets, and terracotta bangles. A circular terracotta sealing is inscribed in Brahmi : *Raja Vasistha Putrasya Shri Bhimsena*, possibly the ruler of Magha dynasty. Above the legend, there is the depiction of a bow and arrow and below is depicted a bull standing in front of a female with her left hand resting on her hip. Two rooms of the size of 1.8 m.×1.38 m. and 1.8 m.× 1.5 m. were also exposed. The size of the brick is 38 cm.×24 cm.×7 cm.

Period IV

The period IV is marked by the occurrence of knife-edged bowls, ring-base, vessels, lids with a hallow conical knob, double-spouted vases and glazed ware. The bricks of this period measure 14 cm.×10 cm.×3 cm. This period belongs to post 11th century A.D.

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63. **Kakwan-A** (26°44′ N : 79°59′ E)

Village Kakwan stands on the right bank of the Kanpur branch canal which is crossed here by the metalled road from Bilhor to Rasulabad, at a distance of about 15 km. S-W from former and 50 km. from Kanpur. The mound is on the western margin of the village and about 50 houses are built right on the mound. It measures 150 m.×150 m. and is 3 m. high. On the mound sherds of the Red Slipped Ware and Coarse Red Ware are found. Brickbats are also present on the mound.

64. **Kakwan-B** (26°44′ N : 79°59′ E)

About 100 m. further west of the above mound there lies another small mound which measures 50 m.×50 m. and is 2 m. high. On the mound sherds of the Red Slipped Ware and Coarse Red Ware are present. Brickbats are very few. The main mound of Kakwan and this one are contemporary.

65. **Kamalpur** (26°16′ N : 79°42′ E)

Village Kamalpur is 12 km. N-E of Sikandara and 10 km. N-W of Bhoganipur. Close to the village on the northern side there is a mound on a big nullah which joins Yamuna after traversing about 1 km. The mound is oval in shape and measures 125 m.×115 m. It is up to 8 m. high. A part of the mound is under cultivation. The ceramic industries represented on the mound are the Red Slipped Ware and Coarse Red Ware. A few sherds of medieval glazed ware were also found.

66. **Kamsan** (26°48′ N : 80°2′ E)

Village Kamsan is 5 km. S-W of Bilhor on the Bilhor-Kakwan road. The mound is just on the northern side of the road. It measures 80 m.×80 m. Some part of the mound has been occupied by a modern village. The height of the mound is nearly 7 m. The sherds of the NBPW, Red Ware and Red Slipped Ware are found on the mound. These sherds are spread in the neighbouring cultivated field. On the western side the mound has been cut and flattened for agriculture. It seems that originally the mound was quite big.

67. **Kamasia** (26°36′ N : 79°50′ E)

Village Kamasia is 12 km. west from Rura and 11 km. N-E of Jhinjhak. The village is on the left bank of the Rind. On the western side of the village, right on the river bank, there is a mound which measures about 300 m. N-S and 200 m. E-W. It is 10 m. high. Due to erosion it has been dissected into several parts. Nearly one-third of the mound is occupied by the modern village. The western part of the mound has been cut at several places and in those cuttings one

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can see the sections exposed, though they are not very regular and clear. All over the open parts of the mound sherds of the PGW, NBPW, BSW, Red Slipped Ware and Red Ware are found. Brickbats are also present on the mound. It seems that the maximum expansion of the mound took place in the NBPW period. The area in which the NBPW is found measures 200 m.×150 m., whereas the habitation area during the Early Historic period seems to have been 225 m.× 200 m.

68. Karankhera (26°23′ N : 80°29′ E)

Village Karankhera is 18 km. S-E of Kanpur and 7 km. north of Mahrajpur. It is a small village which stands on the bank of the Ganga. Just on the bank of the Ganga there is a mound which measures 50 m.×50 m. and its height is 4 m. It seems that most of the mound has been washed away by the river. On all over the mound sherds of the PGW, NBPW and Red Ware are found. There is no indication that habitation continued after the NBPW period.

69. Karchalipur (26°11′ N : 80°19′ E)

Village Karchalipur is 9 km. S-E of Bhitargaon and 36 km. south of Kanpur. The village is on the left bank of the river Rind. Close to the village on the western side there is a mound which measures 170 m. E-W and 140 m. N-S. It is nearly 6 m. high. Part of the mound on the eastern and southern sides is under cultivation. All over sherds of the NBPW, BSW, Red Slipped Ware and Red Ware are found. In the NBPW we find several colours like Black, Golden, Blue and Steel-blue. The PGW is found only in an area of about 100 m.×80 m. towards the river-side. Brickbats are present on the mound but since not a single complete brick was found the exact size is not known; but it seems that they belong to Mauryan and Kushana period.

70. Karchalipur

Village Karchalipur is on the left bank of the Yamuna 12 km. up stream of Musanagar town. Just on the bank of the river there is a mound which measures 160 m.×100 m. It is 5 m. high. Here brickbats are rare. On the whole mound, sherds of the NBPW, Red Ware and Red Slipped Ware are found.

71. Kashipur-A (26°34′ N : 79°56′ E)

Village Kashipur is about 10 km. N-W of Rura and 12 km. S-W of Sheoli police station. The village is on the left side of the river Rind and opposite to Bhaundara village. The mound is about half-a-km. west of the village. The site place is known as Kukarapnwa ghat. The mound is about 75 m. E-W and 50 m. N-S and is 3 m. high. It seems that a considerable amount of erosion has taken place because the sherds of the NBPW, Red Ware and Grey Ware are found even up to 200 m. away from the main mound. All over, sherds of the PGW, NBPW,

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Black Ware and Red Ware are found. Brickbats are very rare. It seems that the habitation did not continue after the NBPW period.

72. Kashipur-B (26°34′ N : 79°56′ E)

This mound is on the eastern side of the village and is on the bank of the Rind. The site has not suffered any erosion. The mound measures about 100 m. E-W and 60 m. N-S and is 5 m. high. The NBPW is found all over but in restricted number. Besides the NBPW, sherds of the Red Slipped Ware, Black Ware and Coarse Red Ware are found. Brickbats are present all over and a few complete bricks measure 37 cm.×27 cm.×13 cm.

73. Kashipur-C (26°34′ N : 79°56′ E)

This mound is towards the north of the village and nearly half-a-km. away from the river. It measures 125 m. E-W and 20 m. N-S and is 5 m. high. On the mound there is no trace of the NBPW or PGW. The whole mound is full of brickbats and the only ceramic industries represented are the Red Slipped Ware and Red Ware. The Red Ware is mostly coarse.

74. Katka (26°37′ N : 79°45′ E)

Village Katka stands on the right bank of the river Rind and is 7 km. north of Jhinjhak. Close to the village on the northern side, right on the river bank there is a mound which measures 150 m. E-W and 100 m. N-S. It is 4 m. high. At places the mound has been eroded badly. All over, sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. Only a few brickbats were seen and these are confined only on the eastern side of the mound.

75. Keilai (26°37′ N : 80°1′ E)

Village Keilai stands nearly 1 km. away from the right bank of the river Pandu and is 4 km. from the Sheoli police station. The mound is on the western side of the village. It is 260 m. E-W and 200 m. N-S and 8 m. high. On the mound sherds of the NBPW, BSW, Red Ware and Red Slipped Ware are found. Brickbats are also found on all over the mound. A few complete bricks measure 39 cm.×27 cm.×13 cm. The area in which the NBPW is found measures about 200 m.×150 m.

76 Khajuri (26°26′ N : 79°46′ E)

Village Khajuri is 4 km. N-W of Derapur and 15 km. S-W of Rura. It is on the left side of the river Sengur. On the southern side of the village there is a small mound which measures 100 m. E-W and 75 m. N-S and is about 5 m. high. Part of the mound on the N-W side is under cultivation. All over, sherds of the

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NBPW, BSW, Red Slipped Ware and Red Ware are found. The whole mound is full of brickbats and a few complete bricks measure 40 cm. ×28 cm. ×8 cm.

77. Khalla (26°27′ N : 79°45′ E)

Village Khalla is 5 km. N-W of Derapur. Nearly 1 km. south from the village, on the left bank of the river Sengur there is a mound which measures 100 m. ×100 m. It is about 5 m. high. It is a mound of the Early Historic period. Only the sherds of Red Slipped Ware and Coarse Red Ware are found here. The mound is full of brickbats. A few complete bricks measure 37 cm. ×26.5 cm. × 7.5 cm.

78. Kheora (26°30′ N : 80°17′ E)

Village Kheora is 10 km. north of Kanpur and nearly 1 km. up-stream of Nawabganj. Close to the village just on the right bank of the Ganga there is a mound which measures 300 m. in length along the Ganga and 160 m. in breadth. It is 8 m. high. On the mound we find the sherds of the BRW, PGW, NBPW, Red Slipped Ware, Red Ware (in fine and coarse fabric) and medieval Glazed Ware. It seems that habitation at the mound continued from the BRW period up to medieval period, maybe with breaks in-between. From the distribution pattern of different ceramic industries it is quite clear that the total mound was not occupied at any cultural period. It appears that habitation during the BRW and PGW was confined to an area of about 100 m. ×90 m. whereas during the NBPW period it was in an area of about 150 m. ×125 m. The sherds of the Red Slipped Ware are distributed over an area of about 200 m. ×160 m. On the mound bricks of the size of 40 cm. ×29 cm. ×8 cm., 37 cm. ×27 cm. ×7 cm. and 17 cm. × 9 cm. ×4 cm. are found.

79. Khera Kursi (26°42′ N : 79°58′ E)

Village Khera Kursi is about 7 km. S-W of Kakwan, 12 km. N-W from Sheoli and 23 km. S-W of Bilhor. The village is on the ancient mound and on the right bank of the river Pandu. On the southern side of the village, the open mound measures 350 m. ×200 m. The total area of the mound, including the area occupied by the modern village, seems to be 400 m. ×400 m. or perhaps more. A part of the mound on the southern side is under cultivation. The height of the mound is nearly 8 m. On the highest spot of the mound there is a modern temple. In the temple, and under the trees one can see broken icons of several gods and goddesses.

On the mound, sherds of the PGW, NBPW, BSW, Grey Ware, Red Slipped Ware, Red Ware of fine and coarse, variety are found. The PGW is found all over the cultivated area, which measures to about 200 m. ×150 m. whereas the NBPW is found in a larger area of about 250 m. ×250 m. It is difficult to estimate the exact size during Early Historic period, as the Red Slipped Ware is found all over the open part of the mound. The part of the mound on which the village is settled

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was also examined in open places. Mainly pottery, bricks etc. belonging to the Medieval period were noticed. No structure or any other sign of the Early Historic period habitation was noticed on this part.

80. Khirsa (26°19′ N : 80°16′ E)

Village Khirsa is 21 km. S-W of Kanpur on the Kanpur-Ghatampur road. On the southern side of the village there is a very large low-lying swampy area. In the village there is a mound which measures 125 m. × 110 m. and is up to 6 m. high. A part of the mound is occupied by the modern village. On the mound only the sherds of the Red Slipped Ware and Red Ware are found. It is Early historic period mound.

81. Kisakhera-A (26°12′ N : 80°26′ E)

Village Kisakhera stands on the right side of the Pandu river, 5 km. south of Narwal and 30 km. south of Kanpur. Close to the village on the eastern side just on the bank of the Pandu there is a mound, part of which on the northern and western side is under cultivation. The total mound measures 130 m. N-S along the river and 80 m. E-W. It is about 4 m. high. The mound is full of brickbats and the ceramic industry respresented on the mound is Red Slipped Ware besides Coarse Red Ware.

82. Kisakhera-B (26°12′ N : 80°26′ E)

About half a km. north from the above mound there is another mound within the village revenue area. The mound is on the bank of the Pandu. It measures about 90 m. N-S and 65 m. E-W and is 3 m. high. On this mound, sherds of the NBPW, fine Red Ware and a few Grey Ware sherds were found. It seems that after the NBPW period, habitation did not continue on this site as there are no ceramic industries or any other cultural remains of the Early Historic period

83. Kishora (26°35′ N : 79°46′ E)

Village Kishora is 8 km. N-E of Jhinjhak railway station. Close to the village on the western side there is a mound which measures 100 m. E-W and 100 m. N-S. It is 8 m. high. It is a mound of the Early Historic period. The only ceramic industry represented on the mound is Red Slipped Ware besides Coarse Red Ware. Enormous amount of brickbats are present. Since not a single complete brick was found its size could not be known.

84. Kismara (26°13′ N : 80°31′ E)

Village Kismara is 8 km. east of Narwal and 30 km. S-E of Kanpur. It is about 1.5 km. from the village Purwamir on the G.T. Road. Close to the village

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there is a mound which measures 150 m. E-W and 130 m. N-S. It is 4 m. high. This mound is of the Earty Historic period. Only the sherds of the Red Slipped Ware and Coarse Red Ware are found on the mound.

85. Kurain (26°5′ N : 80°14′ E)

Village Kurain is 9 km. S-E of Ghatampur and 4 km. east of the Kanpur-Banda railway line. There is a big lake which surrounds the village from all the sides except north.

On the northern side of the village there is a mound which measures 300 m. in length and 150 m. in breadth. It is 6 m. high. The whole mound is littered with brickbats and pottery. The sherds of NBPW, BSW, Red Slipped Ware and Red Ware (in coarse as well as fine fabric) are found on the site. However, the NBPW and BSW are confined to an area of about 100 m. × 100 m. from the western side of the mound. The rest of the site is a later expansion. A few full-sized bricks measure 30 cm. × 21 cm. × 7 cm., 24 cm. × 18 cm. × 6 cm.

86. Kurtha (26°14′ N : 80°19′ E)

Village Kurtha is on the left bank of the river Rind, 3.5 km. N-E of Bhitargaon and 28 km. south of Kanpur. Close to the village, on the banks of the Rind, there is a mound which measures 125 m. E-W and 100 m. N-S. It is 10 m. high. Brickbats are present and a few full-sized bricks measure 38 cm. × 27 cm. × 7 cm. The ceramic is Red Slipped Ware and Coarse Red Ware. It belongs to the Early Historic period.

87. Lala Bhagat (26°43′ N : 79°51′ E)

Village Lala Bhagat is about 3 km. N-W of Asalatganj and 8 km. N-E of Rasulabad. Close to the village on the western side there is a big mound which is visible even from a distance of 3-4 km. It measures 350 m. E-W and 250 m. N-S and is 14 m. high. On the eastern end of the mound there is a small modern temple.

Brickbats are scattered all over the mound. A few complete bricks measure 40 cm. × 29 cm. × 8 cm., 37 cm. × 27 cm. × 7.5 cm., 31 cm. × 20 cm. × 7 cm., and 24 cm. × 18 cm. × 6 cm. On the mound only the Red Slipped and Red Ware is available. The main habitation was during the 10-11th century A.D. When, as is considered today, this was a headquarter of the local ruler under Jaichanda of Kanuaj.

88. Lamhra (26°32′ N : 79°56′ E)

Village Lamhra is on the right bank of the Rind, 6 km. north from Rura town. Close to the village on the northern side there is a mound on the bank of

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the river. It measures 125 m. E-W and 74 m. N-S. It is up to 7 m. high. On the western side of the mound in an area of about 70 m.×75 m., sherds of the NBPW, PGW, fine Grey Ware are found along with Red Ware and Red Slipped Ware. On the rest of the mound towards the east only the post-NBPW pottery and other antiquities are found. Brickbats are found all over.

89. Mahraj Nagar (26°37′ N : 80°8′ E)

Village Mahraj Nagar is 8 km. west of Chaubepur and 8 km. S-W of Sheorajpur. It is 5 km. north of the river Pandu. Close to the village on the eastern side there is a mound which measures 100 m. N-S and 125 m. E-W. It is 3 m. high. The whole mound is full of brickbats and a few complete bricks measure 43 cm.×28 cm.×8.5 cm., 34 cm.×16 cm.×6.5 cm. and 20 cm.×20 cm.×4.5 cm.

On the eastern half of the mound sherds of the NBPW, BSW, Red Ware, Red Slipped Ware and Coarse Red Ware are found. It seems that during the NBPW period, habitation was confined only to the eastern half whereas in succeeding periods it extended to the western part also.

90. Mahrajpur (26°19′ N : 80°28′ E)

Village Mahrajpur is 20 km. N-E of Kanpur and 5 km. north of Sarsol. The village is just on the G.T. Road. On the eastern side of the village there is a mound which measures 150 m.×130 m. It is 7 m. high. A part of the mound is under cultivation. On the western part of it sherds of the NBPW, BSW and Grey Ware are found along with the Red Slipped Ware and Coarse Red Ware which are found all over the mound. Bricks of the Mauryan and Gupta periods are also found on the mound.

91. Mahulia (26°8′ N : 80°22′ E)

Village Mahulia is 11 km. N-E of Bhitargaon and 4 km. north of Jahanabad in district Fatehpur. The village is about 1 km. west from the river Rind. Just on the right bank of the river there is a small mound which measures 100 m.×50 m. It is almost flat. In the middle of the mound there is a small temple made of Medieval period bricks. On the whole mound sherds of the NBPW, BSW, Red Ware (both in fine as well as coarse fabric) and Red Slipped Ware are found.

92. Mandauli (26°29′ N : 79°59′ E)

Village Mandauli is nearly half a km. north of the Roshanmau railway station on Kanpur-Delhi route. On the western side of the village there is a mound which measures 120 m. E-W and 100 m. N-S. It is 6 m. high. The ceramic industries represented on the mound are the Red Slipped Ware, Coarse Red Ware and medieval Glazed Ware. The NBPW was found from the northern part of the mound from an area of about 60 m.×40 m.

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93. Mathurapur (26°9′ N : 80°21′ E)

Village Mathurapur is 9 km. S-E of Bhitargaon and 6 km. north of Jahanabad. Towards the north-eastern side of the village, across the irrigation canal there is a mound on the bank of a nullah which falls into Rind after traversing about half-a-km. The mound measures 220 m. E-W and 160 m. N-S. It is 8 m. high and a part of it on the western side is under cultivation. On the mound only the sherds of the Red Slipped Ware and Coarse Red Ware are found.

94. Mati-kishanpur (26°20′ N : 79°58′ E)

Village Mati-kishanpur is 43 km. from Kanpur on the Kanpur-Kalpi road and 5 km. north of Akbarpur. In the village there is a mound which measures 80 m. × 60 m. It is 5 m. high. On the mound sherds of the NBPW, BSW and Red Ware are found. It seems that after the NBPW period, habitation did not continue on this site.

95. Mawar (26°18′ N : 79°55′ E)

Village Mawar stands on the right bank of Sengur where the Kanpur-Kalpi road crosses the river. It is 4 km. N-E from Malasa railway station. Opposite the village on the left bank on the river there is a mound which has been cut into several parts due to the construction of the railway and road. Overall, the mound measures about 200 m. N-S and 200 m. E-W. It is 7 m. high. All around the mound i.e. towards the river-side sherds of the PGW, BSW, Grey Ware, NBPW are found along with the Red Slipped Ware and Red Ware. As one proceeds towards the eastern side i.e. away from the river one finds only the Red Slipped Ware and Coarse Red Ware. It seems that habitation during the PGW and NBPW period was confined only to the river-side.

96. Milanpur (26°19′ N : 79°35′ E)

Village Milanpur is 7 km. S-W of Sikandara and 10 km. west of the Rajpur police station. Close to the village on the northern side there is a mound which measures about 165 m. E-W and 125 m. N-S. It is nearly 4 m. high. A part of the mound on the western side is under cultivation. On the eastern side of the mound there is a very large low-lying swampy area where water accumulates during the rainy season.

On approximately a two-thirds of the mound from the eastern side sherds of the PGW, NBPW, BSW, Grey Ware and fine Red Ware are found along with the Red Slipped Ware and Coarse Red Ware. On the remaining one-third towards the western side only the sherds of the Red Slipped Ware and Coarse Red Ware are found. This part of the mound seems to be an extension of the Early Historic period.

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97. Musanagar (26°10′ N : 79°58′ E)

The town of Musanagar stands on the Mughal Road at a distance of 15 km. S-E of Bhoganipur and 55 km. S-W of Kanpur. The modern town is about 2 km. east of Yamuna. Between the town and the river are the scattered ruins of different periods. Antiquities of different periods can be seen as as we proceed from the town towards the river.

The main mound of the protohistoric and early historic period is just on the bank of the Yamuna. It is a fairly big mound covering an area of about 400 m. N-S and 200 m. E-W. Due to erosion it has been divided into several parts. Towards the river-side a full profile of the mound is open in which several ring wells can be seen. The sherds of the BRW, PGW, NBPW and Grey Ware along with fine and Coarse Red Ware are confined mainly to the middle part of the mound covering an area of about 200 m.×150 m. The NBPW and Red Slipped Ware are found on a large area of about 250 m.×200 m., whereas during the Early Historic period the whole of the main mound which measures to about 300 m.×200 m. was occupied.

From the distribution pattern of pottery and other antiquities of different periods, it seems that habitation was shifting slowly away from the river and, finally, during the medieval period we find that habitation has slipped away for about 1km. east of the river.

98. Narainpur (26°24′ N : 80°8′ E)

Village Narainpur is about 9 km. S-W of Sanchendi and 20 km. west of Kanpur. The village is on the right bank of the Rind. On the western side of the village there is a mound which measures 90 m.×65 m. and is about 5 m. high. The only ceramic industry found on the whole mound was the Red Slipped Ware and Coarse Red Ware. The site seems to have been occupied during the Early Historic period and deserted fairly soon.

99. Narkhurd (26°38′ N : 79°43′ E)

Village Narkhurd is 8 km. N-E of Jhinjhak. Close to the village, on the left bank of the river Sengur there is a mound, part of which is occupied by the modern village. The mound measures 175 m. E-W and 150 m. N-S. The height of the mound is up to 15 m. The sherds found on the mound are only of the Red Slipped Ware and Coarse Red Ware. A few sherds of the Medieval Glazed Ware were also found.

100. Nawabganj (26°30′ N : 80°17′ E)

Nawabganj town stands on the right bank of the Ganga, at the outskirts of

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Kanpur city. Just on the bank of the Ganga there stands a mound which measures 450 m. N-S and 300 m. E-W. The height of the mound is about 10 m.

Due to the thick deposit of Medieval period debris it was difficult to determine the distribution pattern of the different types of ceramic industries. But, during the survey, it was noticed that the sherds of BRW and PGW, were confined only to an area of about 150 m.×100 m. in the middle part of the mound. The NBPW is distributed over a large area of about 200 m.×200 m. On the mound Red Slipped Ware and Coarse Red Ware are also found. Bricks of the Mauryan period and post-Mauryan period are found in abundance.

101. Nibia Khera (26°7′ N : 80°16′ E)

Village Nibia Khera is 12 km. S-E of Ghatampur on the southern side of the Ghatampur-Jahanabad road. Close to the village there is a mound which measures 90 m.×90 m. It is 4 m. high. The whole mound is littered with brickbats. The ceramic industries found on the mound are NBPW, Red Ware and Red Slipped Ware.

102. Nonha Narsingh (26°38′ N : 80°11′ E)

Village Nonha Narsingh is 1.5 km. N-E from Chaubepur and 7 km. S-E of Sheorajpur. Close to the village towards the eastern side there is a mound which measures 550 m. E-W and 225 m. N-S. It is up to 6 m. high (Pl. VIII A). Two modern temples have been built on the mound—one is of Lord Siva and the other of Goddess Durga. The river Northern Non flows along the foot of the mound on the northern side. From the old course of the river it is clear that earlier the river flowed along the foot of the mound throughout its length and then took a southern turn; but at present it takes a turn to the south by cutting the mound almost from the middle. Due to this cut a massive wall of breadth 5.5 m. to 3.75 m. has been exposed. This wall seems to have been running along the length of the mound and protecting it from the river. A few other walls are also exposed in the mound. The sizes of bricks are 48 cm.×29 cm.×7 cm. to 39 cm.×29 cm.×7 cm. The habitation at the mound started quite early and continued at least up to the Medieval period. The sherds of the BRW, PGW, NBPW, Red Slipped Ware and Medieval Glazed Ware are found. On the eastern half of the mound BRW, PGW and NBPW are present near the Durga temple. Towards the eastern side of the Durga temple PGW was very rare but the NBPW continued to appear along with Red Ware and Red Slipped Ware. The total area in which the BRW and PGW occur measures 125 m.×80 m. near the Durga temple and the NBPW area measures 160 m.×80 m. During the Early Historic period, habitation at this site seems to have been quite big. The total area in which the Red Slipped Ware is found measures 300 m.×175 m.

At the site an inscription was also found. More will be said about this inscription in the next section of this chapter.

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103. Padari Lalpur (26°14′ N : 80°14′ E)

Village Padari Lalpur is 11 km. N-E of Ghatampur and 26 km. S-W of Kanpur. The river Rind is about 1.5 km. north of the village. In the village, near a big pond, there is a mound which measures 120 m. × 100 m. It is up to 12 m. high. On the mound a primary school has been built and also a part of the mound has been cut and flattened. The mound belongs to the NBPW and Early Historic periods. The sherds of NBPW, Red Ware, Red Slipped Ware are found on the mound.

104. Pahewa (26°9′ N : 80°16′ E)

Village Pahewa is 10 km. east of Ghatampur and 5 km. south of Bhitargaon and 1 km. north from the site of Bihupur. Near the village both on the eastern and western sides there are large depressions. The eastern depression measures to about 1.5 km. N-E to S-W and 1 km. N-W to S-W. In both these depressions water accumulates during the rainy season. Close to the village there is a mound which measures 100 m. × 100 m. The height of the mound is 6 m. The mound is full of brickbats. The sherds found on the mound belong to the Red Slipped Ware and Coarse Red Ware ceramic industry.

105. Palhpur (26°12′ N : 80°19′ E)

Village Palhpur is 5 km. S-E of Bhitargaon ond 31 km. south of Kanpur. One km. N-W of the village lies a mound on the left bank of the river Rind. It measures 250 m. N-S and 175 m. E-W. It is 7 m. high. A part of the mound is under cultivation. On the western half of the mound sherds of NBPW, BSW, Grey Ware are found along with PGW and Red Slipped Ware. The eastern part seems to be an extension of the Early Historic period. On this part of the mound only the Red Slipped Ware and Coarse Red Ware are found.

106. Panchgawan (26°26′ N : 80°6′ E)

Village Panchgawan is 2 km. S-E of Purasukal and 7 km. N-W from Sachendi. Close to the village on the northern side there is a mound which measures 125 m. N-S and 70 m. E-W. It is about 6 m. high. Part of the mound on the southern side is under cultivation and it seems that the river has also eroded some mound. On the mound sherds of the PGW, NBPW, Grey Ware (coarse and fine variety) and Red Slipped Ware are found.

107. Panka. (26°44′ N : 80°9′ E)

Village Panka stands on the bank of the Ganga, 5 km. N-E of Sheorajpur and 6 km. S-E of the Uttri Pura railway station. Towards the northern side of the village there is a small mound which measures 75 m. E-W and 50 m. N-S. It

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is about 2 m. high. It belongs to the Early Historic period. On the mound only the sherds of Red Slipped Ware and Coarse Red Ware are found.

108. Panki (26°28′ N : 80°13′ E)

Village Panki is 13 km. west from Kanpur and 2 km. east of the river Pandu. Near the village there is a mound which measures 150 m.×125 m. It is 6 m. high. Brickbats are present on the mound and the ceramic industries represented are Red Slipped Ware and Coarse Red Ware. The site seems to have been occupied during the Early Historic period.

109. Parsaurah (26°45′ N : 79°47′ E)

Village Parasaurah is nearly 8 km. north of Rasulabad. There is a small mound in the village, a part of which is inhabited by the modern village. The total mound measures 75 m.×50 m. In the open parts of the mound bricks of 40 cm.×28 cm.×8 cm. are found. Sherds of the Coarse Red Ware and Red Slipped Ware are also found.

110. Pasikhera (26°10′ N : 80°17′ E)

Village Pasikhera is 4 km. south from Bhitargaon and 10 km. N-W from Jahanabad. Near the village there is a mound which measures 90 m.×70 m. and is 4 m. high. On the mound sherds of the NBPW, BSW, Red Ware (coarse and fine variety) and Red Slipped Ware are found. Brickbats are very rare and since not a single complete brick was found its full size could not be known.

111. Pichora (26°15′ N : 79°40′ E)

Village Pichora is 7 km. S-W of the Rajpur police station and 15 km. N-W of Bhoganipur. Towards the western side of the village, on the bank of the Yamuna there is a mound which measures 130 m. N-S and 100 m. E-W. It is about 9 m. high. The whole mound is littered with brickbats of the Medieval period. Only a few bricks of 39 cm.×28 cm.×8 cm. size were found. The sherds of Coarse Red Ware and Red Slipped Ware are found on all over the mound along with medieval Glazed Ware. A few sherds of the Black Ware were, generally, found in association with the NBPW.

112. Pipergaon (26°20′ N : 80°21′ E)

Village Pipergaon is 15 km. south from Kanpur and 16 km. N-W of Sarsol. It is on the left bank of the river Pandu. Close to the village on the bank of the river there is a small mound which measures 80 m.×60 m. It is about 4 m. high. Part of the mound is under cultivatian. On the mound the sherds of Red Slipped Ware and Coarse Red Ware are found.

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113. Pooran Purwa (26°43′ N : 79°43′ E)

Village Pooran Purwa is 7 km. N-W of Rasulabad and 19 km. north of Jhinjhak. Close to the village on the eastern side there is a mound which measures about 300 m. E-W and 175 m. N-S. It is nearly 10 m. high. On the mound sherds of the NBPW, Red Slipped Ware and Coarse Red Ware were found. The mound is heavily covered by mud. However, only a few NBPW sherds were found over an area of about 100 m.×125 m. on the western side of the mound.

114. Pura Sukul (26°27′ N : 80°6′ E)

Village Pura Sukul is 8 km. N-W of Sachendi and 5 km. S-W of Bhaupur railway station. Close to the village, on the right bank of the river Rind there is a mound which measures 75 m. N-S and 60 m. E-W. It is nearly 7 m. high. According to the villagers a considerable part of the mound has been washed away by the river. On the whole mound sherds of the NBPW, BSW, Red Ware (in fine as well as coarse fabric) and Red Slipped Ware are found. A few complete bricks measure 48 cm.×30 cm.×8 cm.

115. Radhan-A (26°45 N : 80°8' E)

Village Radhan is 3.5 km. east from the Uttri Pura railway station and 17 km. S-E from Bilhor. From Uttri Pura a pukka road leads to the village.

The mound of Radhan, visible even from a distance of 5-6 km., stands on the right bank of the Ganga and is on the southern side of the village. In fact, nearly half of the village itself is on the ancient mound. The lofty and impressive mound measures about 650 m. N-S and 250 m. E-W. The height of the mound varies between 10 and 15 m. On the western side of the mound there is a modern temple. The mound is divided into several parts by rain gullies. The findings on the mound are indicative of habitation on the site right from the BRW period to the present, may be with a break in-between.

The distribution pattern of the antiquities and pot sherds found on it is very clear. It is one of those rare sites where the expansion of settlement through time has been more on a horizontal scale than vertical.

The habitation on the site started from the southern extreme of the mound. From that end to about 200 m. towards north, sherds of the BRW, PGW, NBPW are found along with Red Ware, and Red Slipped Ware. A few sherds of the PGW were found even up to a rain gully locally known as Nathoo Nullah. Beyond this point no trace of the PGW and BRW are found north wards. Only a few Grey Ware sherds were found towards the north of this gully. The sherds of NBPW are found further 150 m. north i.e. up to the modern houses on the mound. The total area covered by the NBPW was about 350 m.×250 m.

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Beyond this we came across the antiquities of the Early Historic and Medieval period. It seems that the modern village is settled over the debris of the Medieval period. The area of the Early Historic period represented by the Red Slipped Ware measures about 450 m.×250 m.

From this mound several terracotta figurines and coins were collected. These will be described in the next section of this chapter.

Charred grains have also been found from this site. As has been stated already several rain gullies have been formed in the mound. In one of the rain gullies, locally known as Nathoo Nullah charred grains of barley (*Hardeum vulgare* Linn.), rice (*Oryza sativa* Linn.) and pea (*Pisum arvance* Linn.) have been collected *in situ* from a band (1.8 m. long and 15 cm. to 20 cm. thick) of charred matter and ash found 2.5 m. below the surface. Along with the grains, sherds of the NBPW and PGW were also found. This indicates that the charred grains belong to the overlap phase of the NBPW and PGW cultures. In the profile exposed towards the bed of the Ganga, one can see the sherds of the PGW and NBPW embedded together. This also indicates that there was an overlap phase between the two cultures at this site.

116. Radhan-B (26°45′ N: 80°8′ E)

This site of Radhan is hardly 150 m. west from the above site. It measures 125 m. N-S and 100 m. E-W. It is up to 10 m. high. This mound is of the Early Historic period. On the mound only the sherds of the Red Slipped Ware and Coarse Red Ware are found.

117. Rahimpur Bisdham (26°49′ N : 79°54′ E)

Village Rahimpur Bisdham is 16 km. west of Bilhor and 2 km. north of the river Pandu, near the border between Kanpur and Farukkhabad districts. About 1 km. north of the village there is a mound which measures 250 m. N-S and E-W. It is about 12 m. high. On the mound sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. The sherds of PGW were found only over an area of about 75 m.×60 m. in the eastern part of the mound and the NBPW in an area of 100 m.×80 m. The rest of the mound is of the post NBPW period. Brickbats are persent on the mound but since not a single brick was found complete its size could not be known.

118. Raipur (26°25′ N : 80°8′ E)

Village Raipur is 4 km. west of Sachandi and 5 km. south of the Bhaupur Manoharlal railway station. The village stands on the right bank of the Rind. Close to the village on the northern side there is a mound which measures 60 m.× 75 m. and is 7 m. high. A considerable part of the mound is occupied by the modern

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village so the exact extent of the mound could not be ascertained but roughly it measures about 125 m. N-S and 100 m. E-W. On the mound sherds of the NBPW, BSW, Grey Ware, Red Ware and Red Slipped Ware are found. On the occupied part of the mound only the Red Slipped Ware and Coarse Red Ware were found in open areas.

119. Ranipur (26°45′ N : 80°3′ E)

Village Ranipur is 4 km. N-W of the Uttri Pura railway station and 9 km. south of Bilhor. The mound is on the western side of the village. It is 150 m. N-S, 80 m. E-W and 12 m. high. The main ceramic industries found are the coarse Red Ware and Red Slipped Ware. Only a few sherds of the NBPW were found. The section in the mound cut on the southern side shows a brick wall. The bricks measure 43 cm.×28 cm.×8 cm. The area over which a few sherds of NBPW were found measures 80 cm.×80 cm.

120. Rasdhan (26°22′ N : 79°4′ E)

Village Rasdhan is 7 km. east of Sikandra and 9 km. north of the Rajpur police station. Close to the village there is a mound which measures 175 m.×150 m. On the mound brickbats are found and a few full size bricks measure 40 cm.× 28 cm.×8 cm. On the mound sherds of the NBPW, Red Ware and Red Slipped Ware are found. The NBPW sherds are confined to an area of 120 m.×110 m. from the western side. The Red Slipped Ware is found all over the mound.

121. Rasulpur Bhuranda (26°12′ N : 80°27′ E)

Village Rasulpur Bhuranda is about 8 km. north from the town of Musanagar. It is on the right bank of the Sengur. The river forms a big loop encircling the whole village except from the south. Just on the bank of the river there is a mound which measures 150 m. E-W and 125 m. N-S. It is 7 m. high. On the mound, sherds of the PGW, BSW, NBPW, Grey Ware, Red Ware and Red Slipped Ware are found. The PGW and NBPW are found only over an area of about 100 m.×60 m. from the western side of the mound. On the rest of the mound only the Coarse Red Ware and Red Slipped Ware are found.

122. Rataipur-A (26°12′ N : 80°23′ E)

Village Rataipur is 6 km. S-W of Narwal and 30 km. south of Kanpur. Close to the village there is a mound which measures 150 m.×75 m. It is 5 m. high. All over the mound sherds of the NBPW, BSW, Red Ware and Red Slipped Ware are found. Brickbats are also present on the mound.

123. Rataipur-B (26°12′ N : 80°23′ E)

In the revenue area of the village there is another mound towards the northern side of the village. It measures 100 m.×100 m. and is up to 4 m. high and

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a part of the mound is occupied by the modern village. All over the mound sherds of the Coarse Red Ware and Red Slipped Ware are found. Sherds of the NBPW were also found near the village over an area of about 75 m.×60 m. A few complete bricks measure 42 m.×28 m.×8 cm.

124. Ratanpur-A (26°36′ N : 79°49′ E)

Village Ratanpur stands on the Rura-Rasulabad road, at a distance of about 10 km. north of Jhinjhak and 6 km. south of Rasulabad. To the south of the village flows the river Rind.

About half-a-km. north of the village there is a mound which measures 90 m. E-W and 65 m. N-S. It is 5 m. high. A major part of the mound is under cultivation. The river Rind flows nearly 300 m. south of the mound and towards the N-E there is a big depression where water accumulates during the rainy season. On the mound sherds of the PGW, NBPW and Red Ware are found. Only a few baickbats are seen on the mound but not a single complete brick was found.

125. Ratanpur-B (26°36′ N : 79°49′ E)

Close to the village on southern side, on the left bank of the river Rind there is a mound, the exact size of which could not be determined because it is occupied by the modern village. The open area measures about 80 m. E-W and 80 m. N-S. It is 6 m. high. The mound is full of brickbats and the pottery industries found on the mound are only the Red Slipped Ware and Coarse Red Ware. The site seems to have been inhabited during the post-NBPW period.

126. Reona (26°12′ N : 80°16′ E)

Village Reona is about 12 km. N-W of Ghatampur. There is a mound in the village part of which is occupied by the modern village. The mound measures 125 m. E-W and 100 m. N-S. It is 5 m. high. On the mound sherds of the NBPW, BSW, Grey Ware, Red Ware and Red Slipped Ware are found. However, the NBPW and associated wares are found only over an area of about 100 m.×75 m. from the eastern side whereas the Red Slipped Ware and associated wares are found all over the mound. Brickbats are present all over the mound.

127. Rohini (26°3′ N : 79°40′ E)

Village Rohini is 12 km. S-W from Derapur and 3 km. from Sikandara and 2 km. from the site of Rasdhan. In the village there is a small square mound which measures 80 m.×80 m. and is 4 m. high. On the whole mound sherds of the NBPW, BSW, Grey Ware, Red Ware and Red Slipped Ware are found. Brickbats are very rare.

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128. Sajeti Badshahpur (26°54′ N : 80°4′ E)

Village Sajeti Badshahpur is 7 km. S-E from the Araul railway station and 10 km. north of Bilhor. The mound is on the western side of the village and right on the bank of the Ganga. It measures 200 m. in length along the Ganga and 125 m. in breadth. According to the villagers nearly half of the mound has been washed away by river which flows along the foot of the mound. On the mound sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. However, the PGW was found distributed only over an area of about 150 m. × 125 m. whereas other ceramic industries were distributed all over the mound. Brickbats are present on the mound. In the rain gullies cut in the mound a large quantity of bones are seen.

129. Sambhalgarh (26°23′ N : 80°8′ E)

Village Sambhalgarh is 3 km. south from Raipur village on the Kanpur-Kalpi road and 5 km. S-W of Sachandi. The village is about 1.5 km. away from the river Rind. Right on the river bank there is a mound which is partly under cultivation. The mound measures 85 × 75 m. and is 3 m. high. On the whole mound sherds of the PGW, NBPW, BSW and Red Ware are found. Brickbats are very rare. It seems that habitation did not continue after the NBPW period.

130. Salempur Mahera (26°38′ N : 80°47′ E)

Village Salempur Mahera is 10 km. north of Jhinjhak and 6 km. south of Rasulabad on the Jhinjhak-Rasulabad road. Just near the road there is a mound which measures 80 m. × 80 m. and is 10 m. high. On the mound only the sherds of the Red Slipped ware and coarse Red Ware are found. The site was occupied only in the early historic period.

131. Sambhua (26°16′ N : 80°14′ E)

Village Sambhua stands on the Kanpur-Ghatampur road, 15 km. from Kanpur. The river Rind flows about half-a-km. north of the village. Just on the left bank of the Rind there is a mound which measures 225 m. E-W and 150 m. N-S. The height of mound is 15 m. Except for the central part (75 m. × 60 m.) the whole mound is under cultivation. Almost in the centre of the mound there is a temple built with late Medieval period bricks. All over the mound brickbats are present. It seems that the maximum expansion of the mound took place during the Medieval period, though it was first occupied during the Early Historic period. A few exposed wall structures of the Medieval period can be seen. The sherds of the Red Slipped Ware are found only in an area of about 125 m. × 90 m.

132. Sandila (26°34′ N : 80°15′ E)

Village Sandila stands on the Mandhana-Bithur road about 3 km. east of

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Mandhana. Towards the south-east of the village there is a mound which measures 100 m. E-W and 100 m. N-S and is nearly 2 m. high. The total mound is under cultivation. All over the mound sherds of the NBPW, Red Ware and Red Slipped Ware are found. It seems that due to cultivation much of the height of mound has been eroded away and the sherds are scattered over a large area.

133. Sanihapur (26°26′ N : 79°46′ E)

Village Sanihapur is about 4 km. west of Derapur and is on the right bank of Sengur. On the bank of the river, west to the village there is a mound which measures about 200 m. E-W and 125 m. N-S. It is nearly 10 m. high. The southern slope of the mound is under cultivation and on the middle of the mound there is a small modern temple. All over the mound sherds of the NBPW, BSW, Grey Ware, Red Ware and Red Slipped Ware are found. However, the PGW is also found on two-thirds of the mound on the western side. No brickbats are found on the mound.

134. Sankim Buzurg (26°16′ N : 80°32′ E)

Village Sankim Buzurg is near the right bank of the Ganga, 6 km. north of Sarsol. In the village there is a mound which measures 150 m.×125 m. It is 4 m. high. Part of the mound on the western side is under cultivation. All over the mound sherds of the Red Slipped and Coarse Red Ware are found. The mound is full of brickbats.

135. Sanon (26°13′ N : 80°17′ E)

Village Sanon is 15 km. S-W from Kanpur, 5 km. S-E of Sachendi and 1 km. south of the Bhimsen railway station. Close to the village there is an oval-shaped mound which measures 130 m.×100 m. It is up to 6 m. high. All over the mound sherds of the NBPW, BSW, Red Ware and Red Slipped Ware are found. Brickbats are very rare.

136. Sapai (26°21′ N : 80°12′ E)

Village Sapai stands on the left bank of the river Rind, about 10 km. south of Sachendi and 20 km. S-W of Kanpur. Towards the south of the village there is a big mound on the left bank of the Rind. It measures 300 m. E-W and 250 m. N-S and 10 m. high. Due to erosion the mound has been cut into two main parts. The northern part, which is adjacent to the village, is lower than the southern part. On the southern part of the mound over an area of about 100 m.× 80 m. the sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. On the northern part of the mound only the sherds of Red Slipped Ware are found along with Red Ware.

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137. Saraiganj (26°43′ N : 80°9′ E)

Village Saraiganj, locally known as Sarayyan is 4 km. N-E of Sheorajpur and 6 km. S-E of the Uttri Pura railway station. Just on the bank of the Ganga there is a mound which measures about 175 m. in length along the bank of the Ganga and 90 m. in breadth. It is 3 m. high and the western part of the mound is under cultivation. On the whole mound sherds of the NBPW, BSW, Red Ware and Red Slipped Ware are found. On the eastern side of the mound over an area of about 100 m.×60 m. sherds of the PGW were also found. This part of the mound is lower than the western part.

A full profile of the mound is exposed towards the bed of the Ganga. In the profile the thickness of deposit on the site is less on eastern side and more on the western side. Attached with the section is a completely exposed well which is made of bricks 21.5 cm.×18 cm.×5.5 cm. in size. It seems that habitation on the mound started from the eastern side and gradually expanded towards the west.

138. Seng-A (26°48′ N : 80°7′ E)

Village Seng is 6 km. N-E of the Uttri Pura railway station. To the east of the village on the bank of Ganga there is a mound which measures 130 m. E-W and 60 m. N-S. .According to the villagers nearly one-third of the mound has been washed away by the Ganga in the last 40 years. The height of the mound is generally 4 m. except in the middle where it is about 10 m. Most of the mound is under cultivation. On all over the mound sherds of the NBPW, Red Ware and Red Slipped Ware are found. Brickbats on the mound are very rare.

139. Seng-B (26°48′ N : 80°7′ E)

Nearly half a km. southwest of the village there is another mound which is almost flat to the level of the surrounding field. It measures 80 m.×60 m. On the mound sherds of the PGW and NBPW are found. No brickbats are found on the mound. It seems that after the NBPW period habitation did not continue.

140. Siddhapur Sheoli (26°36′ N : 80°2′ E)

Village Sheoli is 15 km. from Chaubepur on Chaubepur-Bela road. Nearly 2 km. north of Sheoli there stands a mound on Sheoli-Rura road. The mound has been cut into two parts by the road (Pl. XI B). The mound is nearly 250 m. N-S and 125 m. E-W. It is divisible into two parts—northern and southern. The southern half of the mound, which is under cultivation, is nearly 8 m. high. On this part sherds of the PGW, NBPW, Red Ware and Red Slipped Ware are found. The NBPW is found in several shades.

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On the northern half of the mound which is 5 m. high only the Red Slipped Ware and coarse Red Ware are found along with a few Medieval Glazed Ware remains.

141. Terhawa. (26°30′ N : 80°0′ E)

Village Terhawa is 1 km. N-E of Mandauli and 9 km. N-E of Rura. There is a mound on eastern side of the village which measures 125 m. × 110 m. It is 8 m. high. The total mound is under cultivation. The ceramic industries found on the mound are the coarse Red Ware and Red Slipped Ware. Brickbats are very rare.

142. Tigain (26°28′ N : 79°56′ E)

Village Tigain is 4 km. S-E of Rura and 10 km. N-W of Akbarpur on the Akbarpur-Rura road. In the heart of the village there is a mound of which only the middle part remains. It measures 30 m. × 30 m. × 8 m. in height. Pits have been dug in which the sherds of the NBPW, Grey Ware, BSW, Red Ware and Red Slipped Ware are found. The exact size of the mound could not be known because it has been cut and flattened. Also the houses are too closely spaced in the village. According to the elders of the village it was nearly 150 m. in length and 125 m. in breadth.

143. Tora-A (26°27′ N : 80°7′ E)

Village Tora is about 5 km. N-E of Sachendi and 4 km. south of the Bhaupur railway station. The village stands on the left bank of the Rind. Close to the village on the western side there is a mound which measures 50 m. E-W and 75 m. N-S. It is 4 m. high. It seems that a considerable part of the mound has been washed away by the river. The mound is strewn with the sherds of the PGW, NBPW, Grey Ware, Red Ware and Black Slipped Ware. Brickbats are very rare on the mound. It seems that habitation ceased to exist at the site after the NBPW period.

144. Tora-B (26°27′ N : 80°7′ E)

Nearly half-a-km. north of the above mound there stands a mound on the bank of a nullah which meets the river Rind. The mound measures 140 m. E-W and 110 m. N-S. The whole mound has been cultivated and is almost flat. It is barely 2 m. high. On the mound sherds of the NBPW, Red Ware, BSW, and Red Slipped Ware are found. The whole mound is strewn with brickbats but since not a single brick was found complete, the size of the bricks could not be known.

145. Turrrayya (26°14′ N : 80°18′ E)

Village Turrayya is on the left bank of the Rind and opposite to the village

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Padrihalpur. Close to the village, just on the bank of the river Rind there is a mound which measures 80 m. N-S and 75 m. E-W and 5 m. in height. Part of the mound is under cultivation. Sherds of the NBPW, BSW, Red Slipped Ware and Red Ware are found. Brickbats are very rare.

146. Udaipur (26°11′ N : 79°47′ E)

Village Udaipur is 4 km. east of the Chaurah railway station and stands near the left bank of the Yamuna. Close to the village there is a mound which measures 250 m. E-W and 160 m. N-S. It is 10 m. high. Only the sherds of the Early Historic period i.e. Coarse Red Ware and Red Slipped Ware are found.

147. Udaipur (26°11′ N : 80°19′ E)

Village Udaipur is 6 km. S-E of Bhitargaon and 2 km. south of the site of Palhpur. Close to the village on northern side, just on the bank of the Rind there is a mound which measures 300 m. E-W, 200 m. N-S and is 10 m. high. The whole mound is full of brickbats. Over an area of about 150 m.×10 m. from the western side, sherds of the NBPW, BSW, Grey Ware are found along with Red Ware and Red Slipped Ware. On the remaining, eastern part of the mound, sherds of only the Coarse Red Ware and Red Slipped Ware are found. This part of the mound is an Early Historic extension of the site.

148. Umran (26°24′ N : 80°2′ E)

Village Umran is 13 km. west of Sachendi and 10 km. south of the Maitha railway station. In the village there is a big mound which is visible even from a long distance. It measures 175 m. E-W and 150 m. N-S. It is nearly 8 m. high. All over the mound sherds of Red Slipped Ware and Red Ware are found. The NBPW presence is little and is confined mainly to an area of about 125 m.× 150 m.

The area around the village is marshy and there is a big pond which encircles the village from the northern side.

149. Uttha (26°48′ N : 79°58′ E)

Village Uttha is nearly 10 km. S-W of Bilhor and 3 km. west of Bachana village. To the west of the village there is a mound which measures 160 m. E-W and 130 m. N-S. The height of the mound is about 12 m. A very big pond encircles the present mound from the northern and western side. Around the main mound, after a flat surface of about 10 m., there is a small boundary-wall type collapsed structure. Brickbats are present all over the mound. A few sherds of the PGW were collected from an area of about 80 m.×60 m. On the southern part of the mound. The sherds of Coarse Red Ware and Red Slipped Ware are present all over the mound. It seems that after the PGW period the site was deserted and was reoccupied only during the Early Historic period.

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150. Valmiki Ashram (Bithur) (26°37′ N : 80°16′ E)

Ancient town of Bithur stands on the bank of the Ganga at a distance of 18 km. north of Kanpur city. It is connected with the latter by a metalled road. It is also connected by a branch of the railway which leaves the Kanpur-Farrukhabad line a Mendhana and has its terminus here.

About 1 km. south of the the Ganga there is a place called Valmiki Ashram. It is believed that Sage Valmiki, the author of Ramayana, lived here and to him Sita came in her wandering. The Valmiki Ashram is on a rectangular mound which is about 150 m. E-W and 80 m. N-S. It is 5 m. high. The total mound is surrounded by a boundary wall and is inhabited by sanyasis. Wherever the mound is open, the sherds of the NBPW, Red Ware, Red Slipped Ware and BSW is found. As there was no chance to observe the distribution pattern of the pottery, it has been presumed that the total area was inhabited during the NBPW and Early Historic periods.

From Bithur a large number of copper implements have come to light from time to time (Lal 1951). During my visit to the town six more copper implements came to light (Lal 1978), which have been discussed in the next section of this chapter.

Pottery

During the course of exploration, a very restricted collection of pottey was made. The general characteristic features of the different ceramic industries are the same as described in chapter III. Only the representative shapes are given here.

Fig. 50

1. Bowl of BRW with verticle rim and convex sides (Radhan).
2. Bowl of BRW with verticle rim, slightly bevelled from inside and tapering sides (Musanagar).
3. Bowl of BRW with slightly thinkened and outturned rim and covex sides (Nonha Narsingh).
4. Flat base of BRW bowl with convex sides (Rdhan).

Fig. 51

1. Bowl of grey ware with internally bevelled, vertical rim. It is painted in black with a horizontal band on the inside and outside surfaces. On the outer surface three semicircles have also been drawn (from Radhan).
2. Bowl of grey ware with internally bevelled, vertical rim. It is painted in black on the outer surface with three oblique lines (from Radhan).
3. Bowl of grey ware with internally bevelled, vertical rim and externally grooved sides. It is painted in black with a horizontal rim-band on the inner surface (from Radhan).

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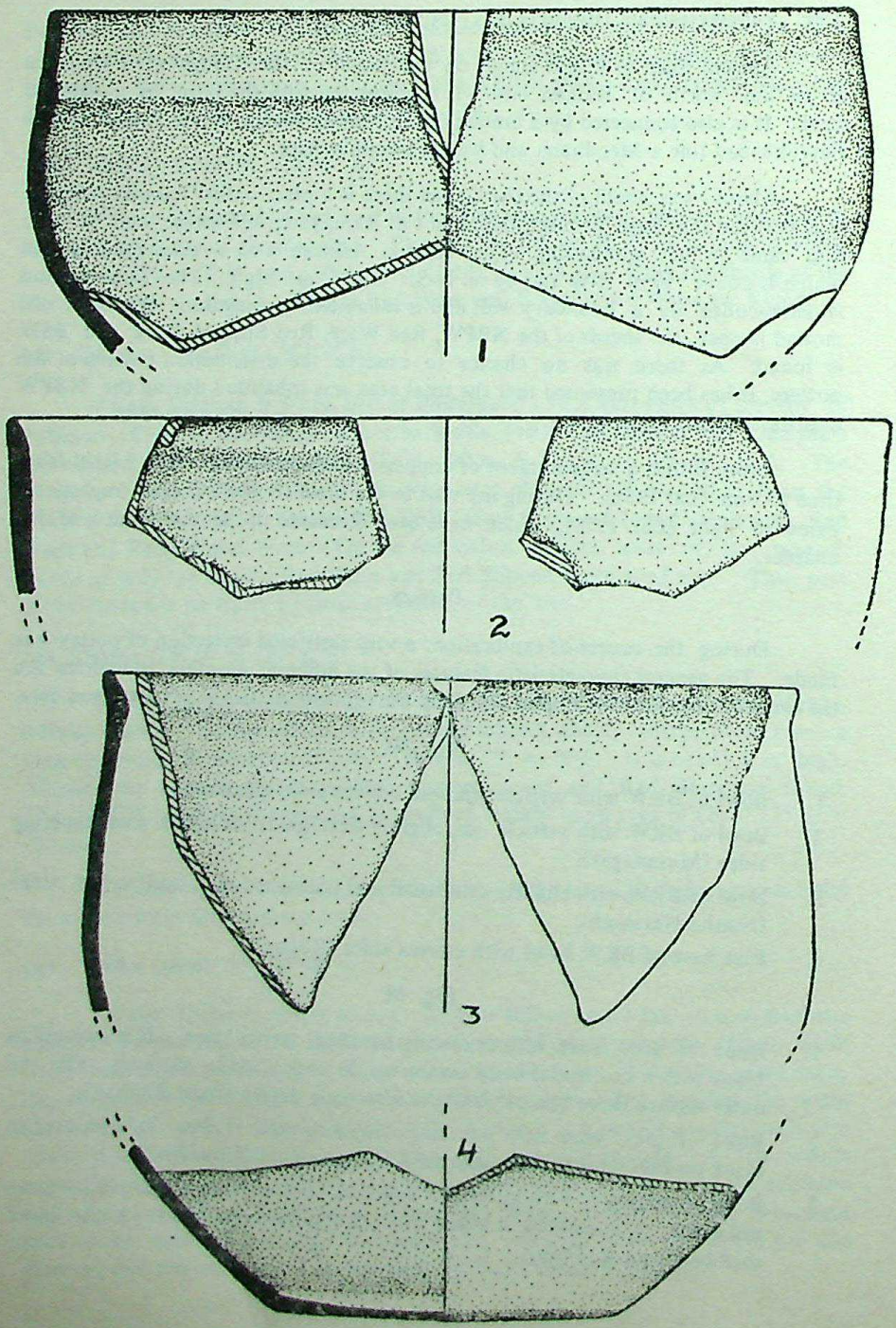

FIG. : 50

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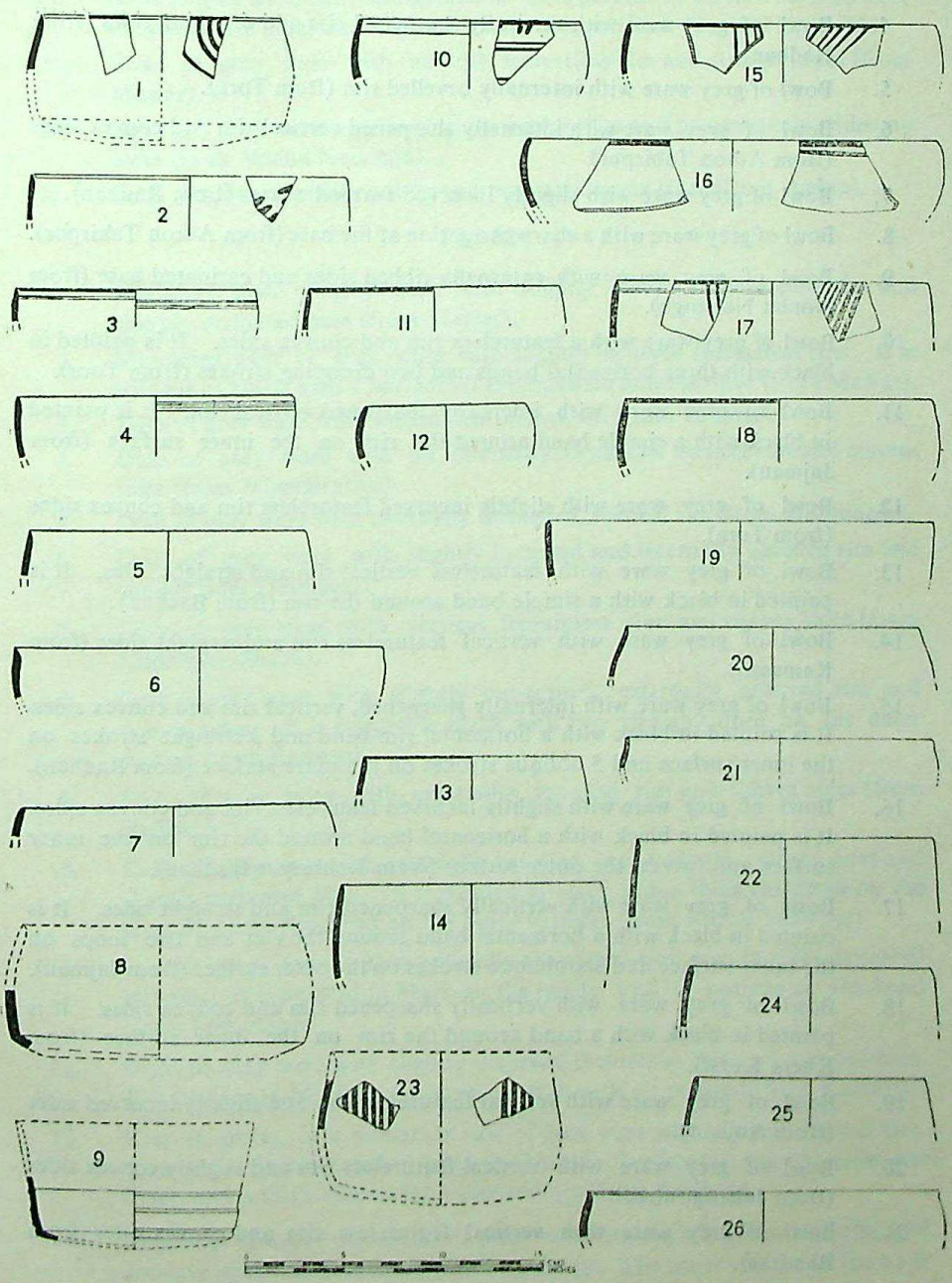

FIG. : 51.

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4. Bowl of grey ware with vertically sharpened rim and drooping sides (from Radhan).
5. Bowl of grey ware with internally bevelled rim (from Tora).
6. Bowl of grey ware with internally sharpened vertical rim and convex sides (from Auron Tahirpur).
7. Bowl of grey ware with slightly incurved featureless rim (from Radhan).
8. Bowl of grey ware with a sharp carination at the base (from Auron Tahirpur).
9. Bowl of grey ware with externally ribbed sides and carinated base (from Nonha Narsingh).
10. Bowl of grey ware with a featureless rim and convex sides. It is painted in black with three horizontal bands and two drooping strokes (from Tora).
11. Bowl of grey ware with internally sharpened vertical rim. It is painted in black with a simple band around the rim on the inner surface (from Jajmau).
12. Bowl of grey ware with slightly incurved featureless rim and convex sides (from Tora).
13. Bowl of grey ware with featureless vertical rim and straight sides. It is painted in black with a simple band around the rim (from Bachna).
14. Bowl of grey ware with vertical featureless rim and straight sides (from Kamasan).
15. Bowl of grey ware with internally sharpened, vertical rim and convex sides. It is painted in black with a horizontal rim-band and 3 straight strokes on the inner surface and 5 oblique strokes on the outer surface (from Radhan).
16. Bowl of grey ware with slightly incurved featureless rim and convex sides. It is painted in black with a horizontal band around the rim on the inner surface and two on the outer surface (from Rahimpur Bisdhan).
17. Bowl of grey ware with vertically sharpened rim and straight sides. It is painted in black with a horizontal band around the rim and two loops on the inner surface and six oblique strokes on the outer surface (from Jajmau).
18. Bowl of grey ware with vertically sharpened rim and convex sides. It is painted in black with a band around the rim on the inner surface (from Khera Kursi).
19. Bowl of grey ware with vertical featureless rim and slightly incurved sides (from Aujhan).
20. Bowl of grey ware with vertical featureless rim and slightly convex sides (from Jahangirabad).
21. Bowl of grey ware with vertical featureless rim and convex sides (from Bhadras).
22. Bowl of grey ware with vertical featureless rim and straight sides (from Auron Tahirpur).

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23. Bowl of grey ware with straight sides. It is painted in black with 6 vertical strokes on the inner and 4 on the outer surfaces (from Nonha Narsingh).
24. Bowl of grey ware with vertical featureless rim and straight sides (from Mawar).
25. Bowl of grey ware with vertical featureless rim and progressively widening sides (from Nonha Narsingh).
26. Bowl of grey ware with out-turned rim and convex sides (from Ankin).

Fig. 52

1. Miniature dish of grey ware with slightly incurved featureless rim and sharply carinated base (from Mawar).
2. Miniature dish of grey ware with slightly incurved featureless rim. It is painted in black with a horizontal rim-band on outer surface (from Mawar).
3. Dish of grey ware with vertical featureless rim (from Bachna).
4. Dish of grey ware with an internally thickened vertical rim and convex sides (from Jahangirabad).
5. Dish of grey ware with internally thickened, vertical rim (from Musanagar).
6. Dish of grey ware with slightly incurved and internally bevelled rim and convex sides (Jajmau).
7. Dish of grey ware with vertical featureless rim and convex sides (from Siddhapur Sheoli).
8. Dish of grey ware with slightly out-turned, externally grooved rim and convex sides. It is painted in black with two straight lines on the outer surface (from Radhan).
9. Dish of grey ware with externally grooved rim and convex sides (from Radhan).
10. Dish of grey ware with externally bevelled, incurved rim, convex sides and sharply carinated base. It is painted in black with a thick rim-band on the inner and thin rim-band on the outer surfaces (from Auron Tahirpur).
11. Dish of grey ware with a vertically sharpened rim, convex sides carinated to base. It is painted in black on the inside with a horizontal rim-band (from Musanagar).
12. Dish of grey ware with slightly incurved featureless rim and rounded base. It is painted in black on the inner surface with a rim-band (from Kamasia).
13. Rim fragment of a miniature vase of grey ware with vertical rim and concave neck. It is painted in black with a thin horizontal rim-band on the inner, and a thick one on the outer surface (from Radhan).
14. Fragment of water vase (*lota*) of grey ware with slightly out-turned rim and concave neck and presumably bulbous body. The inner surface of the neck is corrugated (from Mawar).

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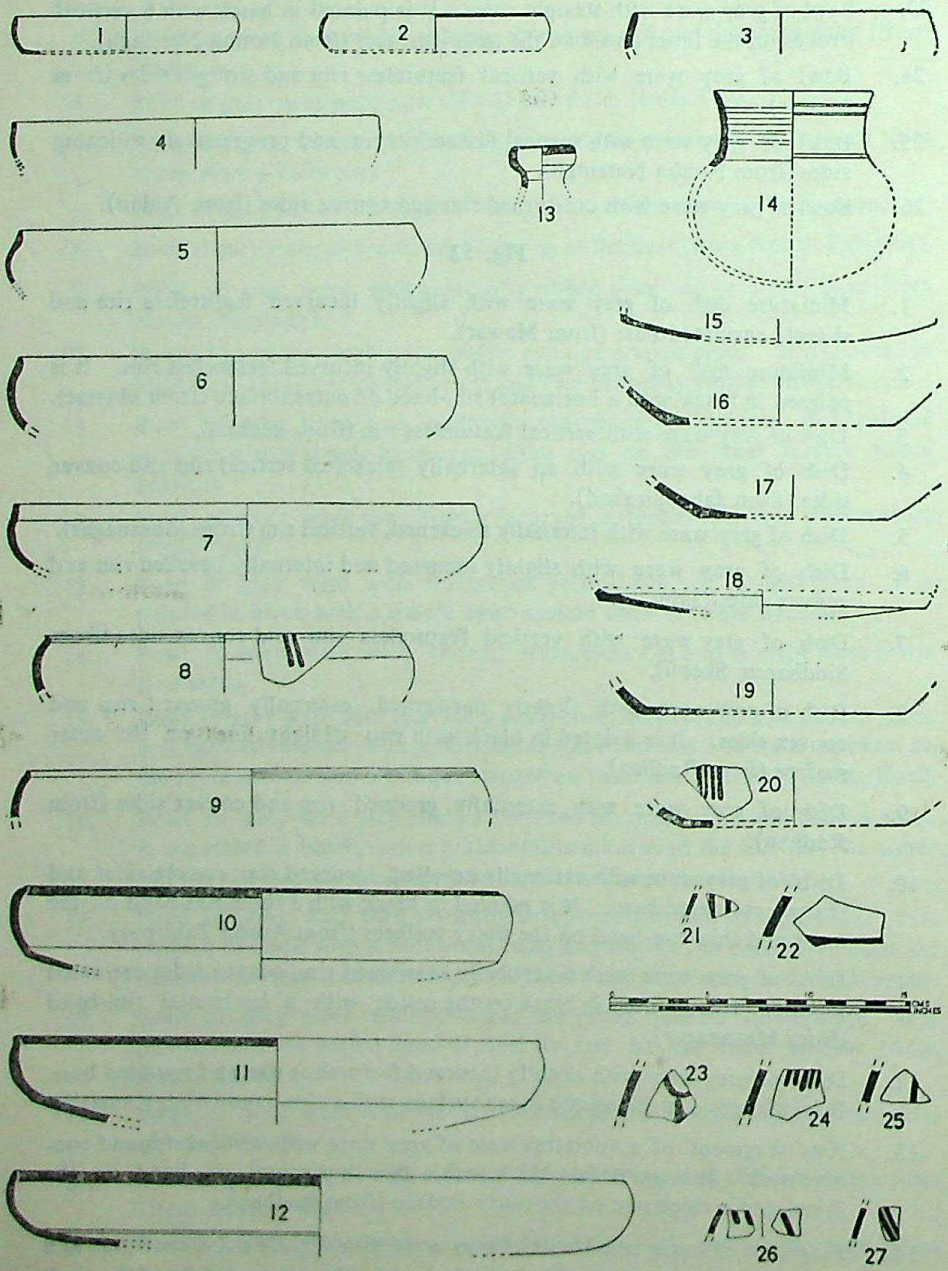

FIG. : 52.

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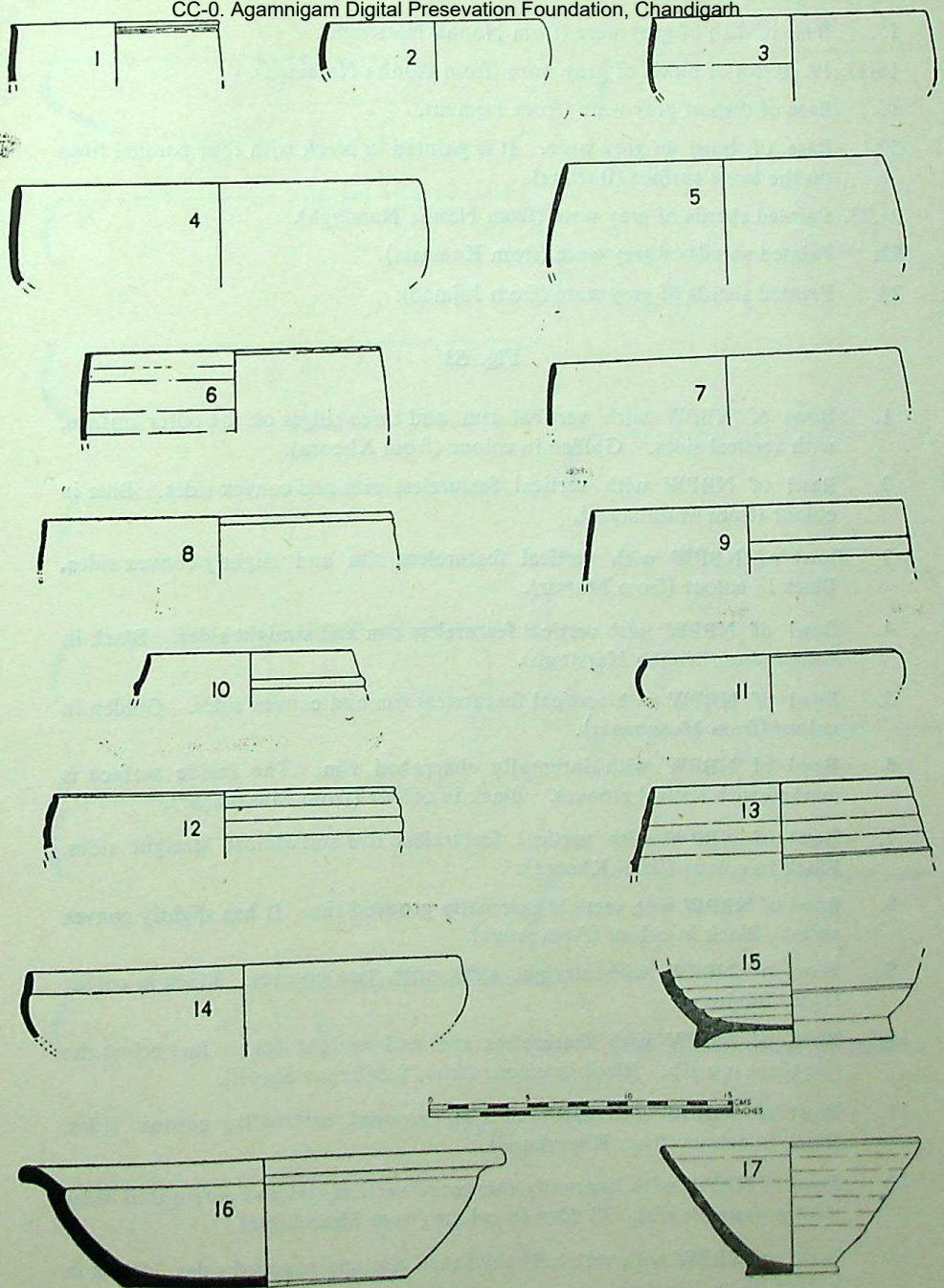

FIG. : 53.

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15. Base of dish of grey ware (from Nonha Narsingh).

16-17, 19. Bases of bowls of grey ware (from Nonha Narsingh).

18. Base of dish of grey ware (from Jajmau).

20. Base of bowl of grey ware. It is painted in black with four parallel lines on the inner surface (Bachna).

21,23. Painted sherds of grey ware (from Nonha Narsingh).

22. Painted sherds of grey ware (from Kamasia).

24. Painted sherds of grey ware (from Jajmau).

Fig. 53

1. Bowl of NBPW with vertical rim and three ridges on the outer surface, with vertical sides. Golden in colour (from Kheora).

2. Bowl of NBPW with vertical featureless rim and convex sides. Blue in colour (from Musanagar).

3 Bowl of NBPW with vertical featureless rim and slightly convex sides. Black in colour (from Mawar).

4. Bowl of NBPW with vertical featureless rim and straight sides. Black in colour (from Nonha Narsingh).

5. Bowl of NBPW with vertical featureless rim and convex sides. Golden in colour (from Musanagar).

6. Bowl of NBPW with internally sharpened rim. The inside surface is marked with several grooves. Black in colour (from Musanagar).

7. Bowl of NBPW with vertical featureless rim and almost straight sides. Black in colour (from Kheora).

8. Bowl of NBPW with vertical externally grooved rim. It has slightly convex sides. Black in colour (from Atwa).

9. Bowl of NBPW with straight sides with two grooves. Black in colour (from Bijaipur).

10. Bowl of NBPW with featureless rim and straight sides. Just below the rim there is a rib. Black in colour (from Siddhapur Sheoli).

11. Bowl of NBPW with incurved rim, grooved externally, convex sides. Black in colour (from Kherakursi).

12. Bowl of NBPW with internally sharpened vertical rim and corrugated sides with prominent ribs. Golden in colour (from Musanagar).

14. Bowl of NBPW with vertically thickened rim and rounded sides. Black in colour (from Bhadras).

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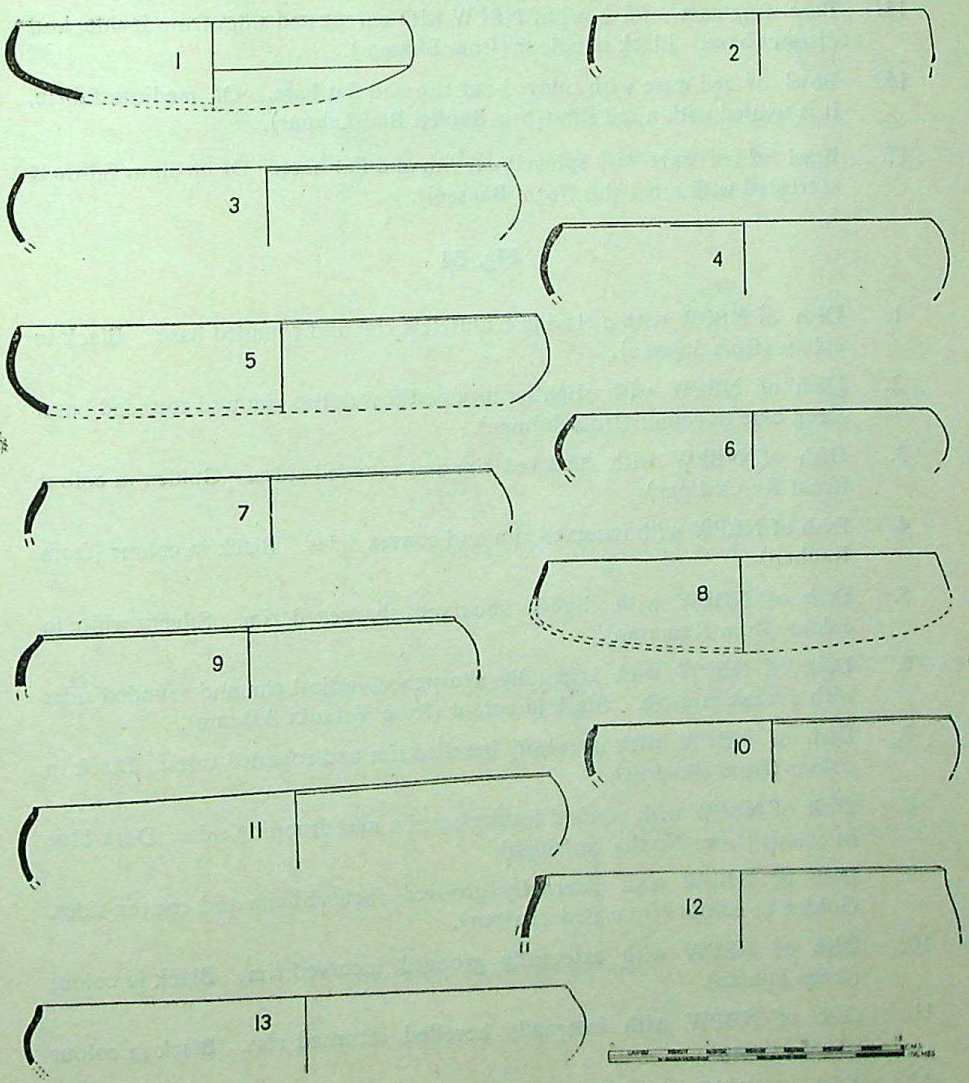

FIG. : 54.

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15. Base fragment of a bowl of NBPW with corrugated sides from inside, and distinct base. Black in colour (from Bhaseni).

16. Bowl of red ware with splayed-out rim and flat base. Of medium fabric, it is treated with a red slip (from Sanjeti Badshahpur).

17. Bowl of red ware with splayed-out rim and flat base. Of medium fabric it is treated with a red slip (from Bhaseni).

Fig. 54

1. Dish of NBPW with a closing featureless rim and rounded base. Black in colour (from Jajmau).

2. Dish of NBPW with slightly inturned featureless rim and rounded base. Deep blue in colour (from Jajmau).

3. Dish of NBPW with incurved rim and rounded sides. Golden in colour (from Karchalipur).

4. Dish of NBPW with incurved rim and convex sides. Black in colour (from Radhan).

5. Dish of NBPW with slightly incurved sharpened rim. Silvery white in colour (from Kamasan).

6. Dish of NBPW with internally sharpened vertical rim and rounded sides with a weak mid-rib. Black in colour (from Valmiki Ashram).

7. Dish of NBPW with internally bevelled rim and rounded sides. Black in colour (from Bhadras).

8. Dish of NBPW with vertical featureless rim and drooping sides. Dark blue in colour (from Nonha Narsingh).

9. Dish of NBPW with externally grooved incurved rim and convex sides. Golden in colour (from Padarilalpur).

10. Dish of NBPW with externally grooved incurved rim. Black in colour (from Jajmau).

11. Dish of NBPW with internally bevelled inturned rim. Black in colour (from Jajmau).

12. Dish of NBPW with straight featureless rim and slightly convex sides. Chocolate colour (from Marwar).

13. Dish of NBPW with short, vertical, featureless rim and rounded sides. Black in colour (from Musanagar).

Fig. 55

1. Dish of BSW with vertical featureless rim and rounded base (from Radhan).

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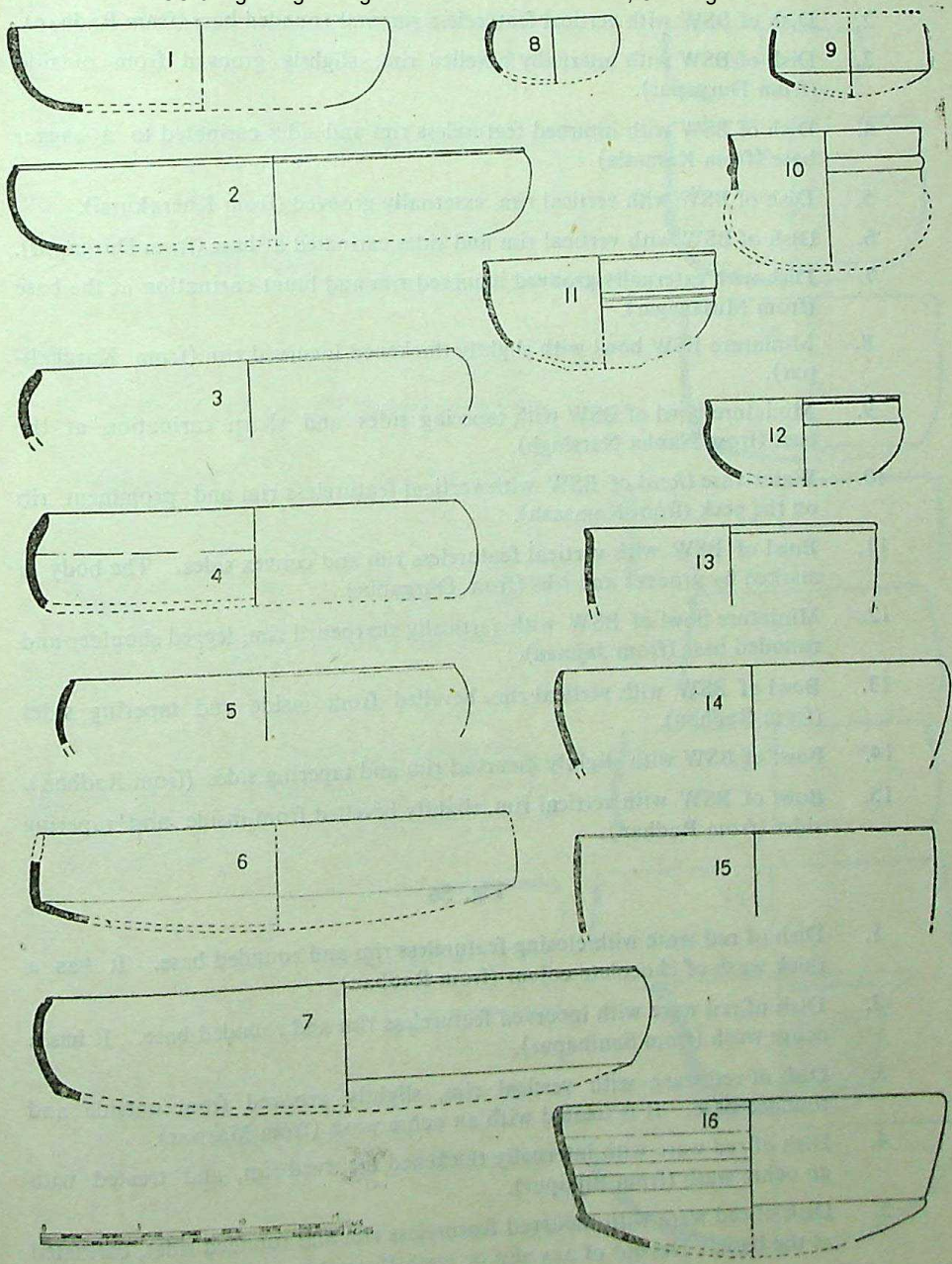

FIG. : 55.

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2. Dish of BSW with vertical featureless rim and rounded base (from Radhan).
3. Dish of BSW with internally bevelled rim, slightly grooved from outside (from Durgapur).
4. Dish of BSW with inturned featureless rim and sides carinated to a sagger base (from Kamasia).
5. Dish of BSW with vertical rim, externally grooved (from Kherakursi).
6. Dish of BSW with vertical rim and sides carinated at base (from Durgapur).
7. Dish with externally grooved incurved rim and blunt carination at the base (from Musanagar).
8. Miniature BSW bowl with slightly thickened incurved rim (from Karchalipur).
9. Miniature bowl of BSW with tapering sides and sharp carination at the base (from Nanha Narsingh).
10. Water-vase (*lota*) of BSW with vertical featureless rim and prominent rib on the neck (from Kamasan).
11. Bowl of BSW with vertical featureless rim and convex sides. The body is marked by grooves and ribs (from Durgapur).
12. Miniature bowl of BSW with vertically sharpened rim, legged shoulder and rounded base (from Jajmau).
13. Bowl of BSW with vertical rim, bevelled from inside and tapering sides (from Radhan).
14. Bowl of BSW with slightly incurved rim and tapering sides (from Radhan).
15. Bowl of BSW with vertical rim, slightly bevelled from inside and tapering sides (from Radhan).

Fig. 56

1. Dish of red ware with closing featureless rim and rounded base. It has a thick wash of chocolate colour (from Radhan).
2. Dish of red ware with incurved featureless rim and rounded base. It has a ochre wash (from Sanihapur).
3. Dish of red ware with vertical rim, slightly grooved from outside and rounded base. It is treated with an ochre wash (from Marwar).
4. Dish of red ware with internally thickened incurved rim, and treated with an ochre wash (from Bijaipur).
5. Dish of red ware with incurved featureless rim and rounded sides, carinated at the base. Devoid of any slip or wash (from Musanagar).
6. Dish of red ware with vertical rim, grooved from outside and sides carinated to sagger base. Devoid of any slip or wash (from Padrilalpur).

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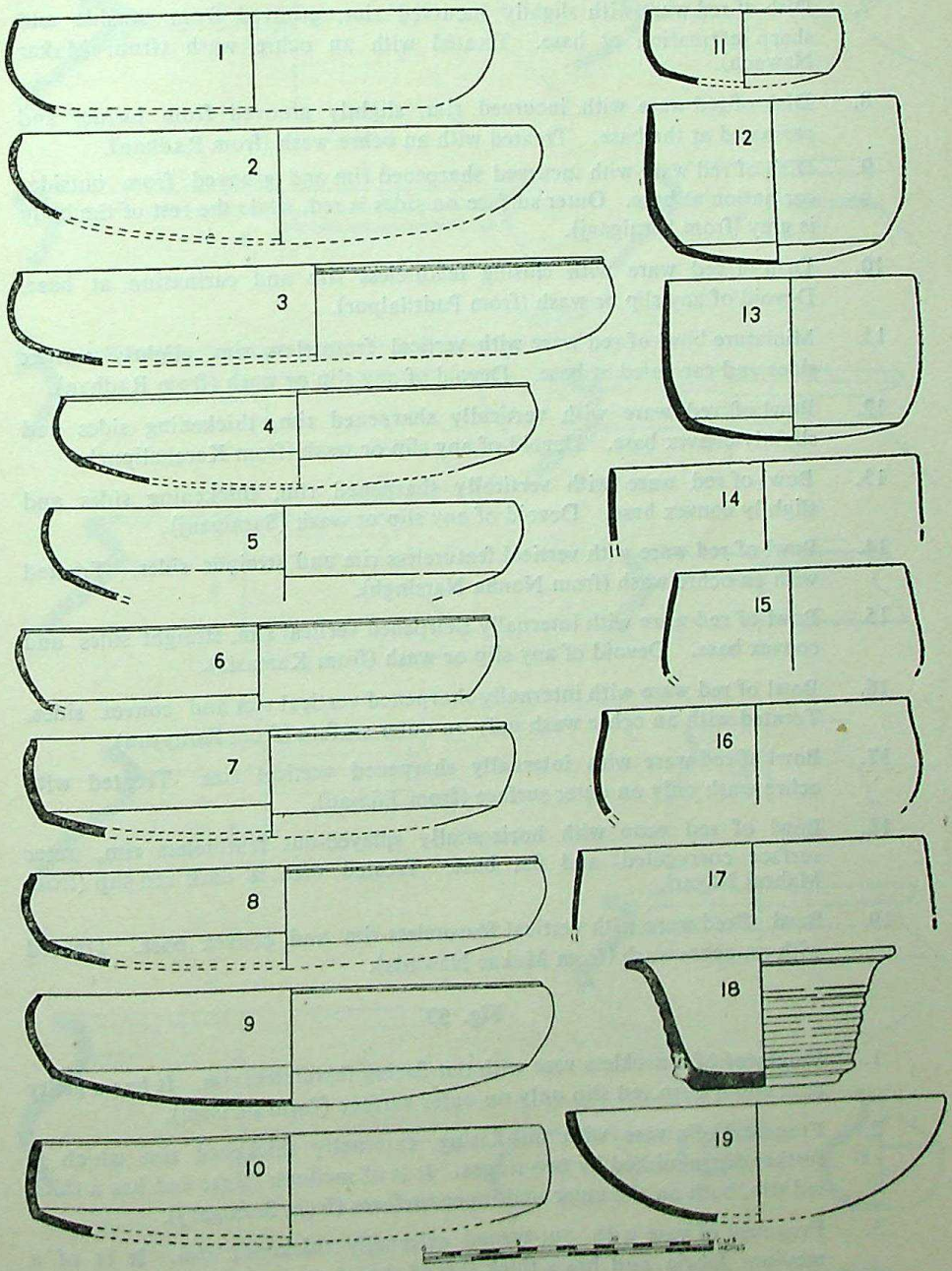

FIG. : 56.

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7. Dish of red ware with slightly incurved rim, grooved from outside and sharp carination at base. Treated with an ochre wash (from Makar Nawada).

8. Dish of red ware with incurved rim, slightly grooved from inside, and carinated at the base. Treated with an ochre wash (from Radhan).

9. Dish of red ware with incurved sharpened rim and grooved from outside; carination at base. Outer surface on sides is red, while the rest of the body is grey (from Saraiganj).

10. Dish of red ware with closing featureless rim and carination at base. Devoid of any slip or wash (from Padrilalpur).

11. Miniature bowl of red ware with vertical featureless rim, slightly convex sides and carinated at base. Devoid of any slip or wash (from Radhan).

12. Bowl of red ware with vertically sharpened rim, thickening sides and slightly convex base. Devoid of any slip or wash (from Karchalipur).

13. Bowl of red ware with vertically sharpened rim, thickening sides and slightly convex base. Devoid of any slip or wash (Saraiganj).

14. Bowl of red ware with vertical featureless rim and straight sides. Treated with an ochre wash (from Nonha Narsingh).

15. Bowl of red ware with internally sharpened vertical rim, straight sides and convex base. Devoid of any slip or wash (from Kamasia).

16. Bowl of red ware with internally sharpened vertical rim and convex sides. Treated with an ochre wash only on outer surface (from Sarayyan).

17. Bowl of red ware with internally sharpened vertical rim. Treated with ochre wash only on outer surface (from Jajmau).

18. Bowl of red ware with horizontally splayed-out featureless rim, outer surface corrugated, and flat base. Treated with a dark red slip (from Mahraj Nagar).

19. Bowl of red ware with vertical featureless rim and convex base. Treated with an ochre wash (from Makar Nawada).

Fig. 57

1. Fragment of a neckless vase with out-flaring featureless rim. It has a gritty core and a deep red slip only on outer surface (from Bhaseni).

2. Fragment of a vase with out-flaring, externally thickened rim which is further distinguished by two ridges. It is of medium fabric and has a thick red slip, both on the outer and inner surfaces (from Saraiganj).

3. Fragment of vase with out-turned externally thickened rim. It is of a medium fabric and has a thick slip of chocolate colour, both on the outer and inner surfaces (from Bhasani).

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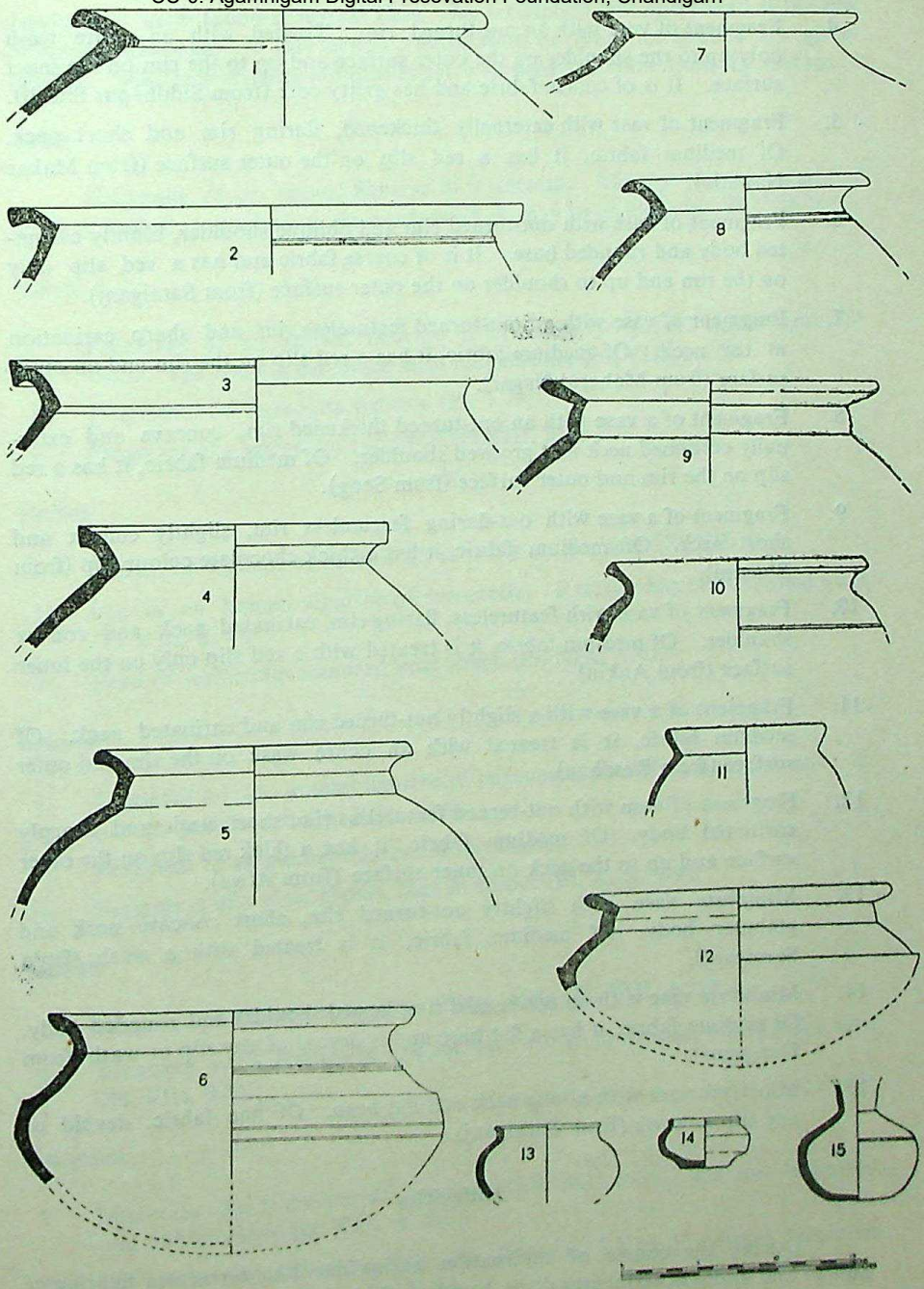

FIG. : 57.

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4. Fragment of vase with an out-turned rim. Treated with an ochre wash only up to the shoulder on the outer surface and up to the rim on the inner surface. It is of coarse fabric and has gritty core (from Siddhapur Sheali).

5. Fragment of vase with externally thickened, flaring rim and short neck. Of medium fabric, it has a red slip on the outer surface (from Makar Nawada).

6. Fragment of vase with out-turned rim and oblique shoulder, bluntly carinated body and rounded base. It is of coarse fabric and has a red slip only on the rim and up to shoulder on the outer surface (from Saraiganj).

7. Fragment of vase with an out-turned featureless rim and sharp carination at the neck. Of medium fabric, it has a red slip on the rim and on outer surface (from Maharaj Nagar).

8. Fragment of a vase with an out-turned thickened rim, concave and externally cordoned neck and grooved shoulder. Of medium fabric, it has a red slip on the rim and outer surface (from Seng).

9. Fragment of a vase with out-flaring featureless rim, slightly convex and short neck. Of medium fabric, it has a thick chocolate colour slip (from Bhaseni).

10. Fragment of vase with featureless, flaring rim, carinated neck and convex shoulder. Of medium fabric, it is treated with a red slip only on the inner surface (from Ankin).

11. Fragment of a vase with a slightly out-turned rim and carinated neck. Of medium fabric, it is treated with an ochre wash on the rim and outer surface (from Rasdhan).

12. Fragment of vase with out-turned featureless rim, short neck and sharply carinated body. Of medium fabric, it has a thick red slip on the outer surface and up to the neck on inner surface (from Atwa).

13. Miniature vase with slightly out-turned rim, short concave neck and globular body. Of medium fabric, it is treated with a wash (from Saraiganj).

14. Miniature vase with an out-turned rim, lagged shoulder and rounded body. Of medium fabric, it has a flat base and is devoid of any slip or wash (from Durgapur).

15. Miniature vase with a long neck and flat base. Of fine fabric, devoid of any slip or wash (from Saraiganj).

Antiquities

During the course of exploration antiquities like terracotta figurine of human and animals, terracotta discs, bangles of glass and terracotta, terracotta

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beads etc. were found at several sites. An inscription was also found at the site of Nanha Narsingh. In this section a description of these antiquities are given sitewise. All the terracotta antiquities are well-fired and come from the surface.

Ankin

Fragment of an animal figurine of terracotta. The legs are thick and tail is short. Red slip is applied on the whole body. It may be an elephant (Pl.VIII. A.3).

Auron

1. Fragment of an animal figurine of terracotta (length 6.2 cm, breadth 3.0 cm.). The body is decorated with incised lines (Pl. VIII. A. 5).
2. Fragment of a terracotta figurine (Pl. V D).
3. Fragment of a terracotta sling ball (Pl.VIII. B. 9).

Bachna

1. Terracotta figurine of an animal, possibly an elephant (Pl. VII. B).
2. Leg of an human figurine of terracotta. Red slip has been applied on it (Pl. VIII. B. 4).
3. Bead of terracotta; standard pear shape (Pl. XIX. A.6).

Bhaseni

1. Fragment of an animal figurine of terracotta, possibly a humped bull. It has red polish on it (Pl. VIII. A. 6).
2. Fragment of an animal figurine of terracotta.
3. Fragments of a glass bangle, blue in colour (Pl. X. A. 7-9).

Bhiwan

1. Fragment of an animal figurine of terracotta (Pl. VIII. A. 2).
2. Fragment of a terracotta figurine with a hole at the end, possibly for cord (Pl. VIII. B.2).

Durgapur

1 Terracotta disc (diameter 4.0 cm. and thickness 1.6 cm.), margins decorated and red in colour (Pl. XIX. B. 5).

2. Terracotta disc (diameter 4.4 cm., thickness 1.5 cm.), margins decorated with punch design (Pl. XIX. B. 9).

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Gurayya

1. Terracotta figurine of a dog (length 9.0 cm.). The eyes are shown by holes. There is a hole through the snout, possibly for cord (Pl. VII C).
2. Terracotta disc (diameter 5.5 cm., thickness 1.6 cm.). One surface of the disc is decorated with continuous wavy lines (Pl.XIX. B. 2).
3. Fragment of terracotta bangle (Pl. X. A. 1).

Kamsan

1. Head of human terracotta figurine; nose and eyes are well carved; short, slit mouth, animal-like ears with deep incisions, hair arranged in a coil above the head. There is a hole in the coil of hair, possibly for cord (Pl. V. B).
2. Terracotta figurine of a human male (5.6 cm.), hands outstretched in form of lumps, mouth demarcated with a line, head and face not very well demarcated (Pl.V. A).
3. Terracotta beads, perfect pear shape (Pl. IX. A. 4,7,8).

Kamasia

1. Terracotta disc, square (3 cm.) in shape. Obverse and reverse surfaces are divided into four equal parts by straight lines. On one surface three short, straight lines are drawn in each of the four parts whereas on the other surface, three short, wavy lines are drawn in each of the four parts. Possibly a game piece (Pl. X. B-C).

Mahraj Nagar

1. Terracotta disc (diameter 4.5 cm. thickness 1-6 cm.). On one surface three incised lines make a triangle; a fourth line divides the triangle into two parts (Pl. IX. B.7).
2. Plain terracotta disc (diameter 4.2 cm.), thickness 1.8 cm. (Pl. IX. B.6).

Musanagar

1. Terracotta figurine of an elephant, partly broken. The seat on the back of the elephant is decorated with a punch design. A rope is shown going through below the neck of elephant and tied to the seat from both the sides. Two rope pieces are shown hanging along the front legs which may have been for hanging bells as is the practice even today. The tail is shown twisted upward. The figurine is red polished (Pl. VII. A).
2. Terracotta bead, standard pear shape (Pl. IX. A. 3).

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3. Terracotta bead, long, convex and circular in shape (length 3.9 cm, diameter 2.2 cm.), (Pl. IX. A. 11).

Radhan

1. Head of a female terracotta figurine (5.7. cm.). It has virtually no head and the face is shown by pinching the mud in the fashion of a bird's beak. Breasts and eyes are separate pieces of clay pasted on the body. In the neck there is a simple necklace. The outstretching arms are short and without any distinction (Pl. IV.A).
2. Head of a female terracotta figurine (8.8 cm.) with broad projecting roll of hair at the back of forehead, prominent goat-like eyes with eyeballs giving the effect of applied eyes, lenticular in form with pierced holes for eye balls. Chin is short and ear lobes elongated. Such terracotta figurines are considered to have the effect of Sasanian-Parsian art. These belong to Kushana period (Agrawal 1948 : 156) (Pl. IV. B).
3. Part of a big panel depicting some mythical story. It shows a human body with a crude head of an elephant and small tusk. Trunk is decorated with punch designs and eyes are quite prominent. One of the hands is shown going up to the trunk. The belly is big in the proportion of body. On the back of the plaque there is a hole which was meant for fixing it with the wall (Pl. VI. B).
4. Fragment of a big panel depicting some mythical story. It is the base of the panel. Two legs of a deity are shown in a dancing posture. The legs are decorated with bangles. Below the feet there is a small human figurine, the head of which is near the front foot. Another human figurine is shown lying on the ground with the hands touching the feet of the deity (Pl. IV. C).
5. Bust of a human male figurine (6.5 cm.). Hair are shown in two side masses, delicately carved small eyes and mouth, and oval face. In the neck there is a simple necklace. The figurine seems to be wearing some cloth covering both the shoulders. The middle portion of the chest is bare. Agrawal (1948 : 118) dates such figurines between 300 and 100 B.C. (Pl. VI. A).
6. A black stone plaque (6.8 cm.×5.6 cm.), partly broken at the top. A snake seems to have been carved on it with its tail coming down after forming a loop in the middle. Hood was probably on the upper part of the plaque which is broken (Pl. VIII. B. 15).
7. This seems to be the head of a bird with a prominent beak and eyes. It was probably the top portion of some lid (Pl. VIII. B. 3).
8. Torso of a female figurine (2.6 cm.). The figure seems to have been very crude. Eyes and breasts are shown just by a little pinching of the clay from the sides (Pl. VIII. B. 14).

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9. Leg of a human figurine of terracotta. It has a red slip on it (Pl. VIII B. 7).
10. Extremely well-carved figure of Ganesh on black lime stone. The features like eyes, ears, trunk, tusks and belly are very neatly carved in such a small piece of 4 cm. (Pl. VI. C).
11. Terracotta disc (diameter 4 cm. thickness 1.0 cm.). The margin are decorated (Pl. IX. B. 8).
12. Terracotta wheel (diameter 4.9 cm., thickness 1.0 cm.) with a hole in the centre. Outer margins are decorated (Pl. IX. B. 10).
13. Terracotta disc (diameter 7 cm., thickness 1.6 cm.) (Pl. IX. B. 1).
14. Plano-convex wheel (diameter 3.5 cm., thickness 1.5 cm.) dull black in colour and not well-fired (Pl. IX. A. 9).
15. Terracotta bead of standard vase shape (Pl. IX. A. 10).
16. Terracotta bead of standard pear shape (Pl. IX. A. 1).
17. Terracotta conical object, probably a pendant or game man (Pl. VIII. B. 13).
18. Bead of carnelian of standard ellipsoidal shape (Pl. IX. A. 14).

Sanihapur

1. Terracotta disc (diameter 3.0 cm., thickness 2.0 cm.) with decorated edge (Pl. IX. B. 4).
2. Terracotta bead of vase-shape (Pl. IX. A. 12).

Saraiganj

1. Terracotta female figurine shown sitting on a big chair or throne. Hands are shown resting on knees. Breasts are shown by sticking on two small pieces of clay. A plain neck. It has been given a red slip (Pl. IV. D).
2. Fragment of an animal figurine of terracotta (P. VIII. A. 8).
3. Fragment of an animal figurine of terracotta, possibly of a bull (Pl. VIII. A. 7).
4. Fragment of a terracotta fish. A hole pears in the form of eyes. This may have served the purpose of a cord as well (Pl. VIII. B. 8).
5. Fragment of a terracotta figurine (Pl. VIII. B. 6).
6. Terracotta bead of perfect pear shape (Pl. IX. A. 2).
7. Terracotta bead of perfect pear shape (Pl. IX. A. 5).

Seng

1. Fragment of animal figurine of terracotta (Pl. VIII. B. 5).

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2. Potters' stamp with pedestal-shaped broken handle (Pl. VIII. B. 12).

Siddhapur Sheoli

1. Foot of human terracotta figurine (Pl. VIII. B. 10).
2. Terracotta human male figurine (5.2 cm.) Modelling is extremely crude. Figure has a slab like body with pinched out triangular arms. The nose is a pinched up ridge in which a straight depression represents the mouth. (Pl. V.C).
3. Terracotta seal with a perforation in the middle and concentric circles on one surface. It has been taken out of a nice mould (Pl. IX. A. 13).
4. Fragment of blue glass bangle (Pl. X. A. 3-6).
5. Fragment of a terracotta bangle (Pl. X. A. 2).

Copper Objects From Bithur

During my visit to the town in 1977, enquiries with local people brought to light a new and as yet unreported hoard which includes some completely new types. This hoard is kept in a private temple belonging to Shri Arjun Panda on the Ganga Ghat in Bithur town. According to Shri Arjun Panda the implements were found in the bed of the Ganga along the left bank, some forty years ago, and have not been examined earlier by any one. These are six implements of which three are harpoons and three celts. The harpoons are quite different in shape from those reported earlier and include two distinct and new types. The description of the implements is as follows :

Harpoons (Plate XI. A)

This is biggest of the three pieces, and measures 28.2 cm. in length. The length of the blade is 15.7 cm. of which the upper 7.5 cm. consists of the pointed tip and in the lower part slanting barbs have been cut by a fine chisel; eight on the right margin and seven on the left. The barb-cutting style is very similar to that of a harpoon from Mainpuri (Smith 1905). The maximum breadth of the blade, 4.3 cm. is at its base from where it tapers upwards. The breadth of the stem where it meets the blade is 1.7 cm. The thickness of the stem and the blade, except the upper half of the pointed tip, varies between 1.0 cm. and 1.1 cm. Sixty-two millimetres below the root of the basal pair of barbs there are three pairs of rectangular projections within a space of 4.0 cm. The breadth of the stem just above the uppermost pair of projections is 1.3 cm. The length across the projections is 4.0, 4.1 and 4.3 cm. and thickness on the margins 0.4, 0.5 and 0.4 cm. respectively from top to bottom. The space between the adjacent projections is 0.3 cm. The breadth of these projections is 1.1, 1.2 and 1.1 cm. respectively. The weight of the harpoon is 465 gm.

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No. 2. This is the smallest specimen and measures 21.4 cm. in length. The length of blade is 10.1 cm. The maximum breadth of the blade is at the base : 4.6 cm. At the base there are two pairs of barbs similar to those of specimen No. 1. Immediately below them is a pair of incurved barbs. They are broader at the root and grow narrower towards the tip. The maximum breadth across the barbs is 6.4 cm. The breadth of the stem is 1.4 cm. The blade and stem have a uniform thickness of 1.0 cm. Thirty-seven millimetres below the root of the incurved barbs there are three pairs of rectangular projections on both sides of the stem. The projections are within a space of 3.1 cm. The length of the projections across is 3.8, 3.8 and 3.9 cm. and breadth 0.7, 0.8 cm. respectively from top to bottom. The thickness on the margins of the projections is 0.4, 0.3 and 0.3 cm. respectively. The space between the two projections is 0.4 cm. The weight of the harpoon is 360 gm.

No. 3. This harpoon is 25.3 cm. in length. The length of the blade, which is more symmetrical than the other two specimens is 14.7 cm. and the maximum breadth, at the base, is 5.3 cm. There are two depressions on both sides of the blade running parallel for half the length from the base. There are four pairs of tiny barbs at the base of the blade. The breadth of the stem just below the basal pair of the barbs is 1.6 cm. Forty-nine millimetres below the basal pair of barbs there are three pairs of projections. The projections are within a space of 3.4 cm. The length of the projections across is 3.1, 3.9 and 3.9 cm. and the breadth is 0.8, 0.9 cm., respectively, from top to bottom. The thickness of the projections on the margin is 0.6, 0.5 and 0.5 cm. respectively. The space between the adjacent projections is 0.4 cm. The thickness of the harpoon varies between 0.9 and 1.3 cm. The weight is 500 gm.

The nearly uniform thickness of all the three harpoons indicates that they have been cut from a single metal sheet.

There are several differences between these harpoons and others so far known from the copper hoards. In specimen No. 1 the barbs are tiny and more in number than those of type A harpoon from Sarthauli (Lal 1951 : Pl. II. 2) and three specimens from Bithur, reported earlier (Smith 1905 : Pls. IV. Shastri 1915 : Pl. III). The incurved barbs of specimen No. 2 are very much dissimilar to the incurved barbs of the harpoons of type B, reported from Bisauli (Lal 1951 : Pl. V, 2) and Saipai (Lal 1972 : Pl. XLIII, C). The barbs of the harpoons from above-mentioned sites are relatively thin and circular in cross-section whereas in this case the barbs are quite thick and rectangular in cross-section. While each of these harpoons has three pairs of projections on the stem, in earlier reported harpoons there is either a forked hook, as in the case of Sarthauli, (Lal 1951 : Pl. VII, 2) or holed lug as in the examples from Bithur (Smith 1905 : Pl. IV) and Bisauli (Lal 1951 : Pl. V, 2). The projections found in the harpoons reported here probably served the same purpose as the holed lug or forked hook did in other specimens.

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Celts (Pl. XI. B)

No. 1. This is an elongated flat celt similar to the celts previously reported from Bithur and now kept in the Allahabad Municipal Museum (Lal 1951 : Fig. 3, 1), Lucknow State Museum (Smith 1907 : Pl. IV, 1) and a celt in Oertel's collection (Shastri 1915 : Pl. II, 2). The length of the celt is 16.4 cm. The breadth at the crescentic sharp edge is 10.2 cm., at the base 8.0 cm. and in the middle 8.4 cms. The thickness is 0.8 cm. in the centre and 0.6 cm. at the margins. At the base it is 0.4 cm. in the centre and 0.2 cm. on the margins.

No. 2. This is a flat celt with a pronounced splayed and sharp edge. The length of the celt is 23.8 cm. The breadth at the edge is 17.6 cm. and at the base 13.2 cm. The thickness in the centre is 1.1 cm. and on the margins 0.5 cm. The celt has four depression marks on one surface near the left margin towards the edge similar to those on some celts from Navdatoli (Sankalia 1974 : Fig. 167, 2-4), Nakarahia, Bulandshahr and Gandhauli (Thapliyal and Shukla 1976 : Fig. 1, 3-6).

No. 3. This is a flat celt of rectangular shape. Its length is 17.0 cm. The breadth at the edge is 8.5 cm. and the base 8.0 cm. The thickness in the centre of the celt is 1.0 cm. and on the margins 0.7 cm. Its shape is very similar to a celt found earlier from Bithur, now in the Allahabad Municipal Museum (Lal 1951 : Fig. 3, 7).

Inscription from Nonha Narsingh (Pl. XII).

The stone bearing the inscription was found lying on the mound near the temple of Noneshwar Mahadeo in the village Nonha Narsingh. The inscription is fragmentary as the top and the side portions of the slab have been lost. The missing fragments could not be traced in spite of my best efforts. A detailed study of this inscription has been carried out (Thapliyal and Lal 1982). Here I shall confine only to the salient features of the inscription.

As has been pointed out earlier, the inscription is fragmentary in nature. It, however, seems that the last line of the extant portion of the epigraph was the last line of the complete original epigraph[1]. The assertion is based on two considerations. In the first place, the space below the line 14 was sufficient to contain one more line, considering the spacing between the lines of the inscription. But this space is blank. Secondly, in the present inscription, the last two lines, 13 and 14, bear the names of the composer and engraver of the inscription respectively. It is well to remember that, in epigraphs of a similar nature, names of composer and engraver, as a rule find mention at the end. Metrical and other considerations suggest that either there was one or no letter before *gurum* in the third line and the vertical stroke after it shows the end of the second *pada* of the

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Text of the Inscriotion

1 ---ᴗᴗ-ᴗ-ᴗ तनय [.] --ᴗ-

2 [ᴳ] व्वालादित्य① इति क्षितौ कृत पदं --ᴗ-- [गु] रुं।②

3 यत्राधाय च वेधसीव मधुजित्-श्री भोजदे -ᴗ-

4 ---[तिं] मेव भोगिशयने सम्वाह्यमानः③ श्रिया ॥।

5 ----लयपरिचय श्यामवेलावनान्ता

6 मुर्त्वीगु-ᴗᴗ मवधिया विभ्रतः शुभ्रकीर्तेः ।

7 सूनुः पुण्यैः ᴗ ᴗᴗᴗᴗ- श्री शुभादित्यनाम ।

8 येनायं चक्र [व] ᴗ ᴗᴗ--ᴗ---ᴗ कामो ॥ 2

9 दारैः पञ्चमहाक्रतून्न्र ᴗ ᴗ---ᴗ--ᴗ-

10 ---क्षितिपोप देशा गुरूणा न्यास्यं ᴗ --ᴗ-[।*]

--- ᴗᴗ -ᴗ-ᴗ [त ?] मुदोविद्वद्विजानित्यहो

11 पुं- -ᴗᴗ-ᴗ-ᴗᴗᴗ ---ᴗ- म्यादरी ॥ 3

12 पद्मनाम मुनेर्व्व ...

....ᴗ-ᴗ [म्रा] चस्य श्री खिरूपिणी ॥ 4

....ᴗ----...ᴗ.-ᴗ- : ।

13 वन्धं④ सलवणासिन्धोर्व्वव..ᴗ -ᴗ- [॥ *] ॥ 5

14 .... ᴗ--- ... त्युक जन्मनः ।

लिखिता श्री ᴗ--- .... ᴗ-ᴗ- [॥ *] ॥ 6

---

1 Read बालादित्य 2 Read गुरून् 3 Read संवाह्य 4 Read बन्धं

FIG. : 58.

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first verse which (*pada*) begins with (r) *Valaditya* in line 1. The first line and beginning of the second line obviously contained the first *pada* of that verse. It thus seems likely that the first line of the extant epigraph was also the initial line of the original epigraph.

The reconstruction of the text of verses 3-6 (see text) indicates that there is a general tendency of increasing the number of letters from line 9 onwards. A few more letters could be adjusted within the same space by writing them a little closer to each other or by reducing their size. It, however, seems more likely that the width of the portion covered by the writing in the lower portion was more in comparison to the upper one, allowing more space for writing in each line.

The letters of the epigraph have been engraved neatly, boldly and meticulously. The language is Sanskrit and the text is in verse. A vertical stroke marks the end of the half verse, and two vertical strokes that of a full verse. The extant portion shows that there were six verses. The metres of the verses are : verse 1 *sardulavikridita*, verse 2 *Manaa kranta*, verse 3 *sardulavikridita* and verses 4-6 *anushtubh*.

The letters of the inscription bear a close resemblance to those of the Pratihara epigraphs of the tenth century A.D.[2] For this reason, as also for considerations of the historical importance contained in the epigraph and discussed below, it should be dated to the first half of that century. As regards the shape of letters of the epigraph, the letter *g* closely resembles the letter *s* as also *bh* with *h* and *dh* with *eh*. Some of the letters, particularly *k d p m y r e y* are almost identical to their Devanagari counterparts. The *matras a*, *i*, *u* and the symbols for *anusvara* and *visarga* closely resemble those in the Devanagari script. In the case of *matras e* and *o*, the slanting stroke above the letters are slightly curved and more horizontally placed.

As regards orthography, the points worth mentioning are : use of *v* for *b* (as in *Vvaladitya*, line 2, *Vandham*, line 13), duplication of *v* when preceded by *r* (as in *r Vvaladitya*, line 2; *Murvvim*, line 5; *Munervva*, line 11; *Salavanasindhorvva*, line 13), duplication of *t* when preceded by *r* (as in *kirtteh*, line 6); duplication of *t* when followed by *r* (as in *yattradhaya*, line 3); use of *m* for *anusvara* (as in *samvahvamanah*, liue 4); and use of *anusvara* in place of *m* at the end of a half verse (as in *gurum*, line 3).

Because of the fragmentary character of the epigraph, there are many lacunae in the text, hence it is not possible to give its faithful translation. In the following pages a general idea of the contents, line by line, partly through reconstruction of the text of similar epigraphs of the period, has been presented.

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Of line 1 only five letters at the right end are partly preserved, the rest being completely lost. Of these, the last three can be deciphered as *tanayah*.

Line 2 refers to one Baladitya who puts his foot on earth (*kshitau krita padam*). This may either refer to his birth or to his conquest of some territory. It is suggested that in the first line the name of Baladitya's father with or without his epithets should have been mentioned, as the word *tanayah* indicates.

In line 3 mention is made of Bhoja. The letter that follows *ja* of *Bhoja* is *de*, after which the letters have been lost. It seems that *de* was followed by *va*, the complete name being Bhojadeva. He has been linked to Madhujit (literally, conqueror of (the demon) Madhu, i.e. Vishnu). There is also a reference to Brahma (*Vedhas*) in this line.

In line 4, the description : "lying on the serpent's bed with feet being pressed by (the goddess) Sri" (*Bhogi 'sayane samvahyamanah 'Sriya*) obviously refers to Vishnu.

The mention of dark forests on the sea-shore ('*Syamavetavana*) in line 5 conveys that the territory of the king or his fame extended up to the sea-shore.

In line 6, there is a reference to the intelligence and bright fame of someone and to his pious son, whose name 'Subhaditya occurs in the line that follows (line 7).

Line 8 records the performance of five great sacrifices by someone, along with his wives. The five great sacrifices must obviously refer to the *devayajna* (i.e. making offerings into fire in the name of deities), *pitriyajna* (i.e. offering *sradha* to one's forefathers), *bhutayajna* (i.e. offering *bali* to the beings), *manushayajna* (studying the scriptures).

In line 9, perhaps the same person (i.e. 'Subhaditya) has been referred to as an expert in imparting instruction to kings (*kshitipo-padesaguru*).

In line 10, there is a reference to the learned Brahmanas (*Vidvadvija*) and the missing portion of the line seems to have conveyed the idea of their being respected and/or suitably rewarded. It seems that all the references that follow the name 'Subhaditya (line 7) are related to him in some way or other.

Line 11 refers to a venerable woman, most likely 'Subhaditya's wife. This very line also gives the name of 'Padmanabhamuni. Padmanabha is a name of Vishnu, who, as seen above has been mentioned in lines 3 and 4 and, therefore, it is natural to infer that the reference is to that deity. But this does not seem to be the case because the name Padmanabha is followed by the appallation *muni*.

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It seems more likely that the line recorded the performance of an act of piety (which, on the analogy of other epigraphs, it can be suggested, was the main purport of the inscription) done on the instruction of a saint (*muni*) named Padmanabha, who might have been the preceptor of 'Subhaditya and/or his wife. Bits of evidence indicate that in all likelihood the pious act was related to the construction of a Vishnu temple at the site. The epigraph, as seen above refers to Vishnu as *Madhujit* and also his lying on the serpent's bed. Further, the name of the village, Nonha Narsingh, is derived from *Narsimha*—the man-lion incarnation of Vishnu. Local tradition also corroborates this issue. It is quite likely that an idol of *Narsimha* was installed in the temple. It may, however, be noted that no remains of such a temple have so far been traced. It seems that, in course of time, the temple crumbled. The place, however, continued to be regarded as sacred throughout the centuries, and in modern times two temples—one of Siva and the other dedicated to Goddess Durga have come up at the site. Obviously Saivism and the Saktism became more popular than Vaishnavism in that region.

Line 12 describes a lady with a likeness to 'Sri . . (*Sririvarupini*). The extant line begins with *mna*. It is reconstructed as *namna* and suggested that this was preceded by the name of the lady who has been compared with 'Sri'.

Line 13 mentions one Lavanasindhu as composer of the text of the epigraph. The word *janmanah* at the beginning of the extant portion of the last (14th) line would indicate that either the parentage or place of birth of the person was mentioned in the missing part. In that very line, after *likhita Sri*, there was perhaps the name and also a few particulars of the engraver of the epigraph, as is the case with other epigraphs of a similar nature.

The epigraph assumes special significance because we find mention therein of two important historical personages—Bhoja and Baladitya. All bits of evidence—palaeography, the find spot (the site being close to Kannauj, the capital of Gurjar Pratiharas and the reference to Baladitya)—strongly indicate that the Bhoja of the epigraph is identical with the king Bhoja of the Gurjar Pratihara dynasty. The Baladitya of the inscription is identified with the homonym of the Guhila dynasty of Dhod, known from his Chatsu inscription[3] in which it is recorded that this feudatory's greatgrandfather Harsha conquered the kings of Udichya and presented to king Bhoja horses which could traverse the Indus.

The details regarding the relationship between Bhoja and Baladitya have been lost. But as the name Baladitya (occurring in line 2) is followed by that of Bhoja in the next line (line 3), it is reasonable to assume that they were contemporaries, and that Baladitya like his predecessor, was a feudatory of the Gurjara Pratiharas. Bhoja, the overlord of Harsha Guhila, is taken to be identical with Bhoja I (c. 836-85 A.D.) of the Gurjara Pratihara dynasty. It is hardly likely that Bhoja I is a contemporary of the latter's greatgrandson, Baladitya.

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Therefore, the Bhoja of this epigraph should be identified with Bhoja II (c. 910-14 A.D.) who was the grandson of Bhoja I.

Likewise, because of the damaged condition of the epigraph the relationship between Baladitya and Subhaditya cannot be ascertained with certainty. But since both have names ending in aditya, it is tempting to suggest that there was a close kinship between them. From the Chatsu inscription we know that Baladitya had three sons bearing names Vallabharaja, Vigraharaja, and Devaraja respectively. No further information is available about them from that source, or for that matter, from any other source.

The non-mention of the name 'Subhaditya amongst Baladitya's soos in the Chatsu inscription would rule out the father-son relationship unless it is presumed that he was born after the engraving of that inscription[4]. If, however, 'Subhaditya be just a name, (and not a title) this epigraph brings to light a prince in the Guhila dynasty not known so far from any other source.[5]

Notes

1. The possibility of a few letters as a beginning of the next line engraved on the missing part of stones cannot be ruled out.
2. E.g. the Chatsu inscription of Baladitya, *Epigraphia Indica* XII, pp. 10-17.
3. *Epigraphia Indica* XII pp. 10-17.
4. The genealogy from Harsha to Baladitya runs as Harsha—Guhila I Bhatta—Baladitya (*Epigraphia Indica* XII, p. 12.).
5. Very likely, he was a grandson of Baladitya and his father's name was mentioned in the missing part of the epigraph, somewhere between line 2, mentioning the name Baladitya, and line 7, mentioning the name Subhaditya.

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XI. Copper Hoards from Kanpur
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Plate 1 (a).

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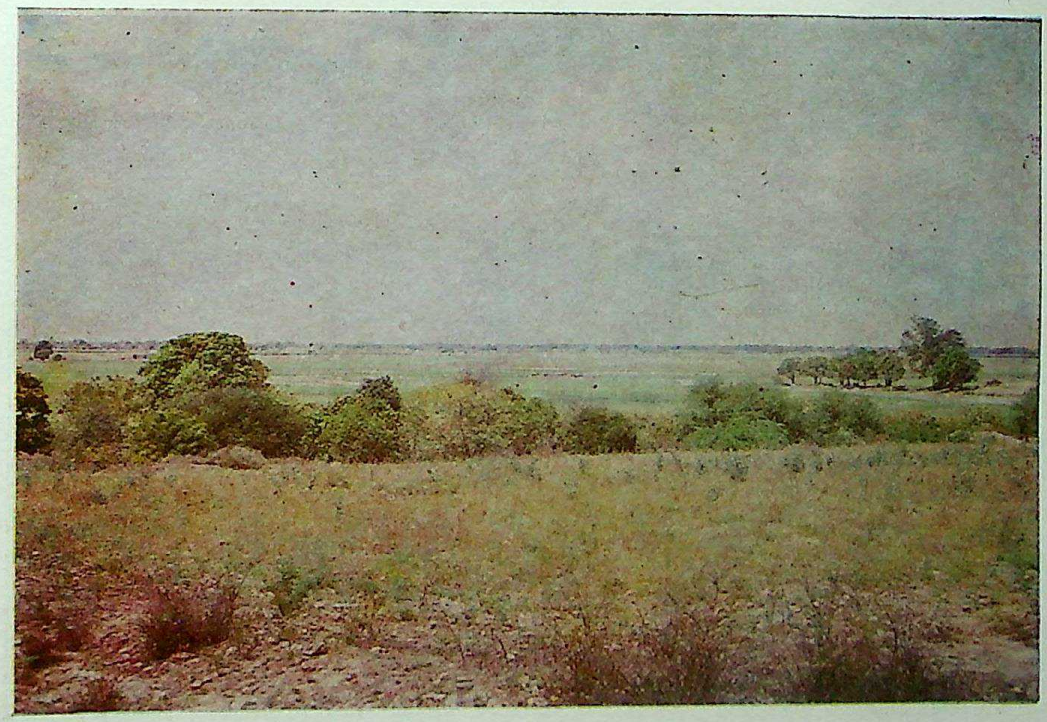

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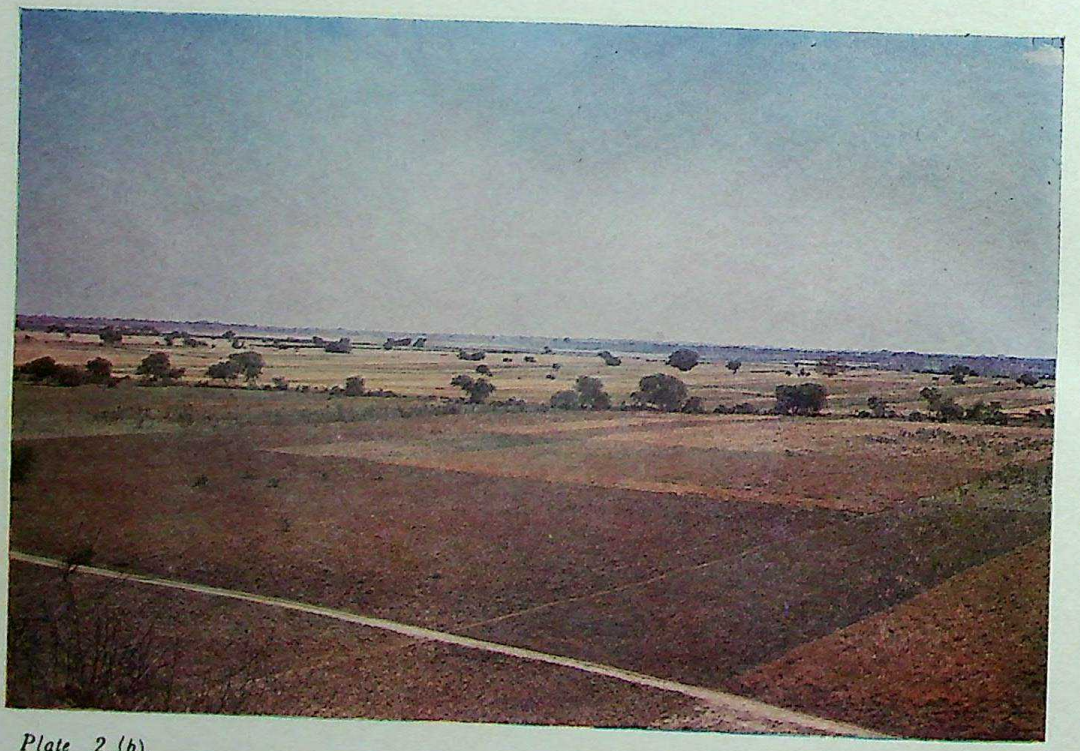

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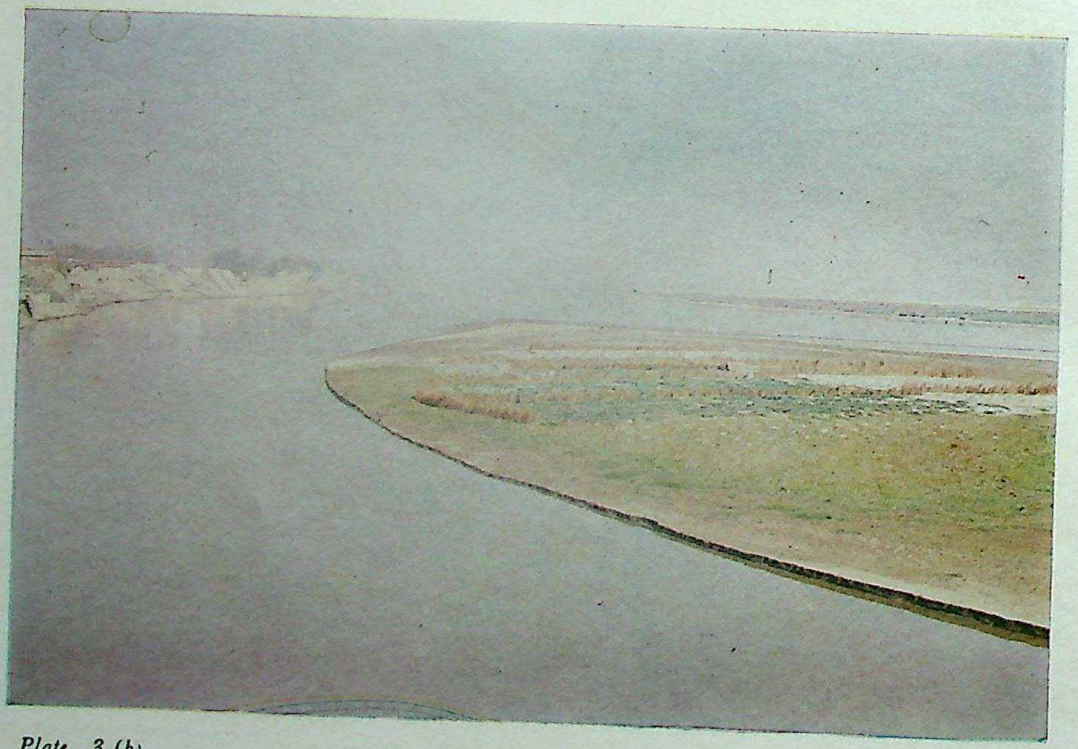

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Plate 4 (a).

Plate 4(b).

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Plate 4 (c).

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Plate 5 (a).

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Plate 5 (c).

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Plate 6 (a)

Plate 6 (b).

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Plate 7 (b).

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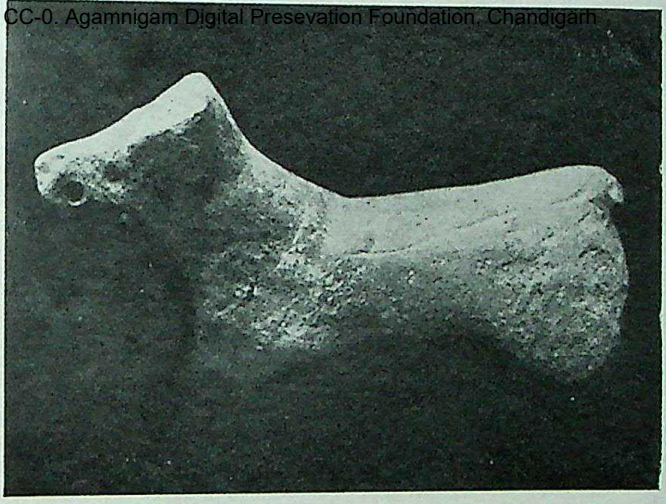

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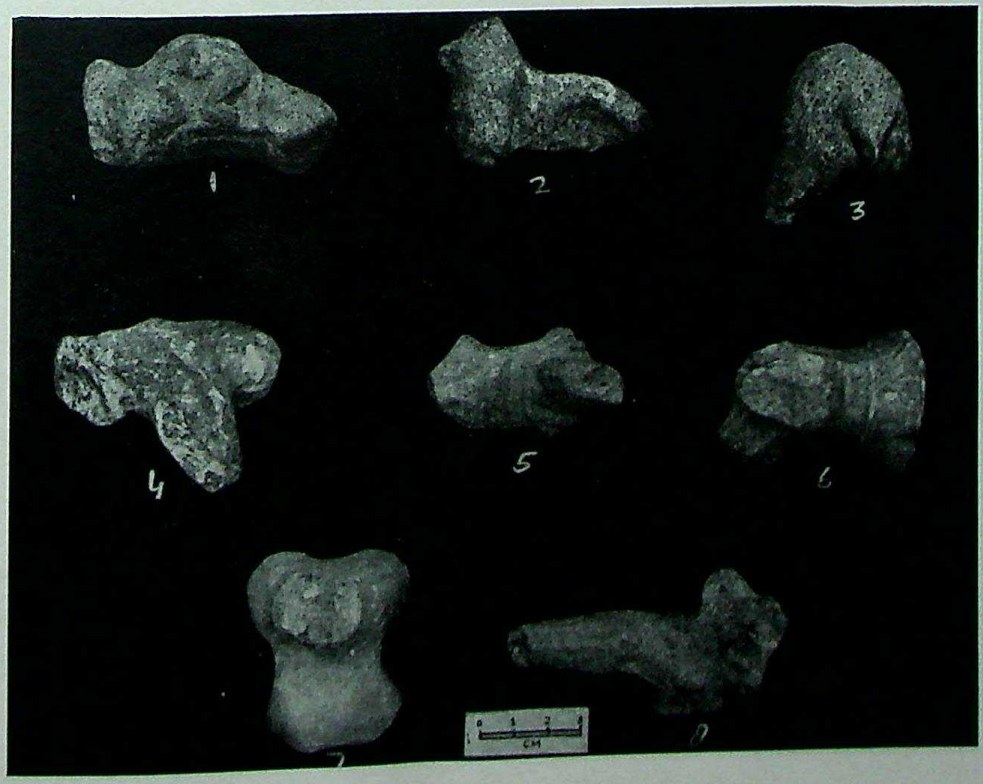

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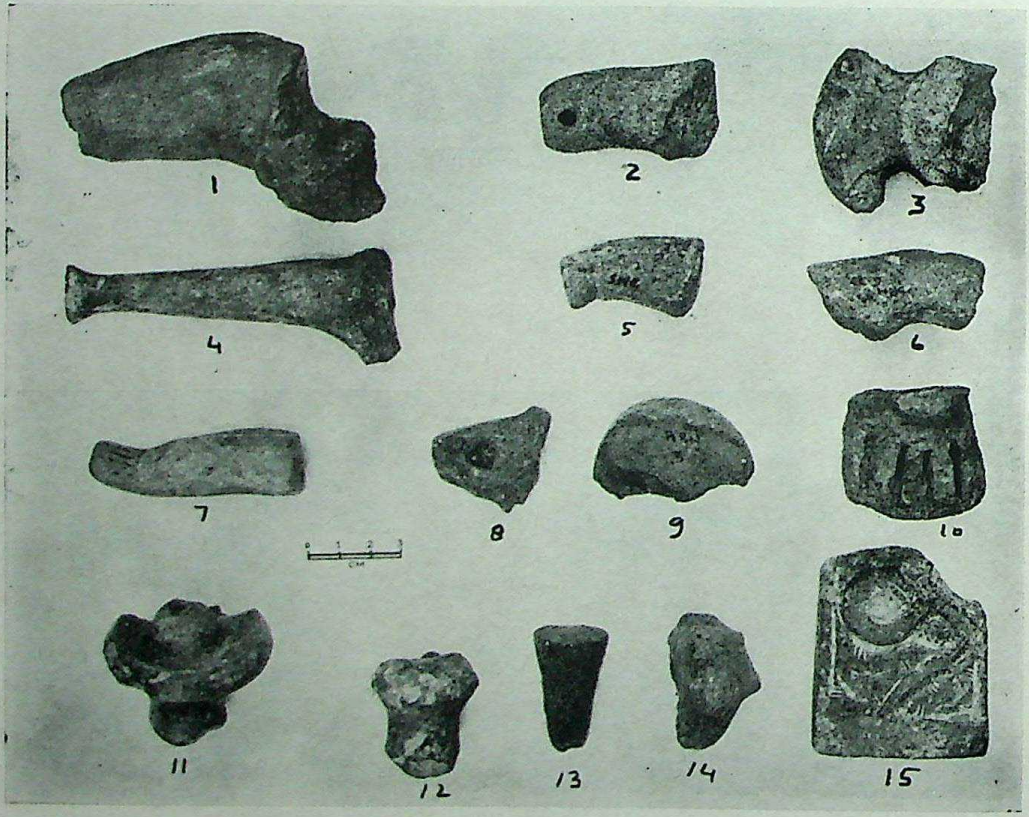

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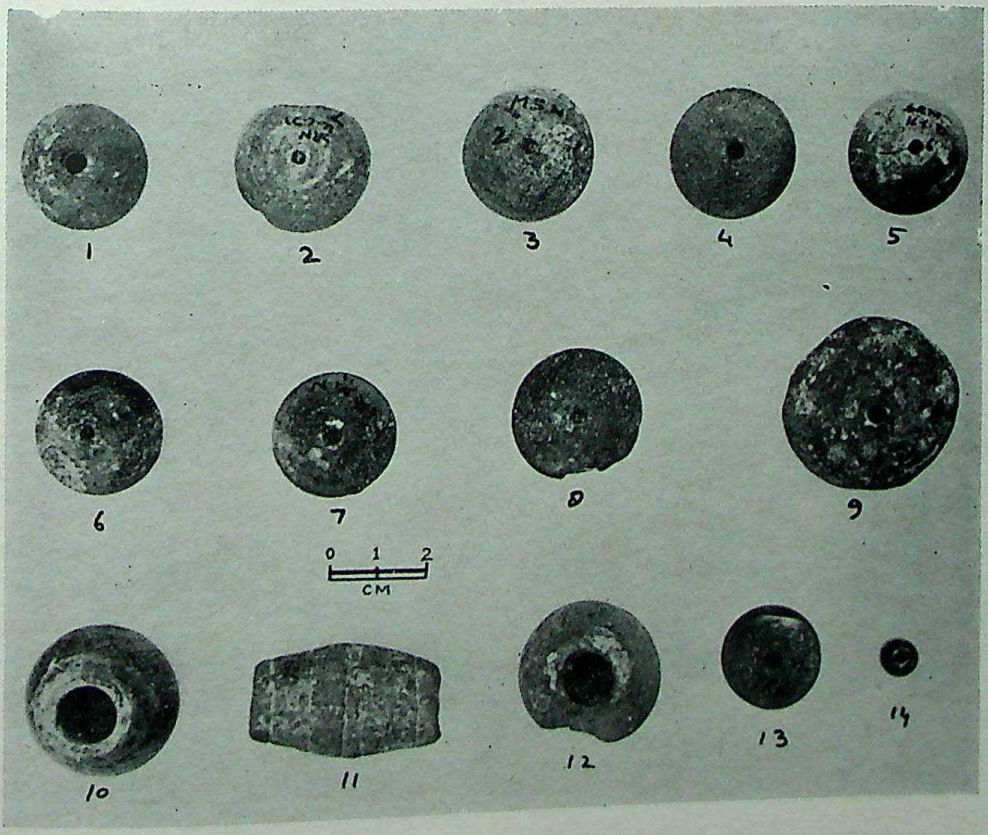

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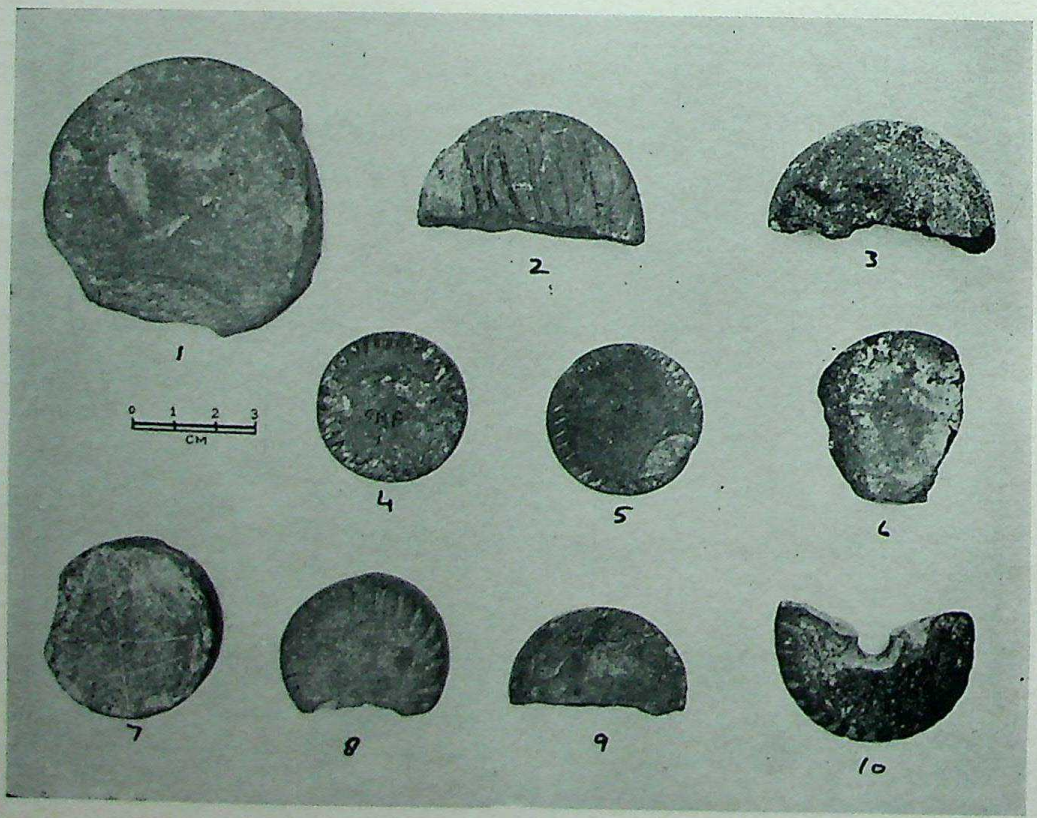

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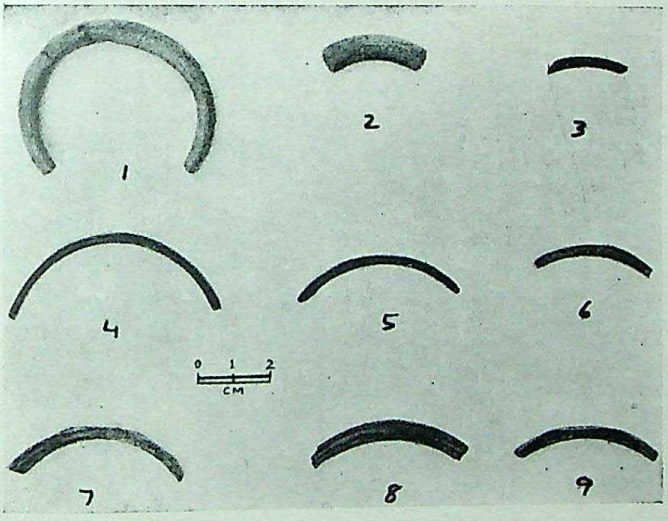

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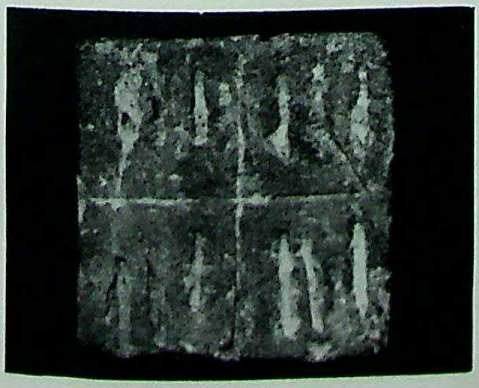

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Plate 10. (c)

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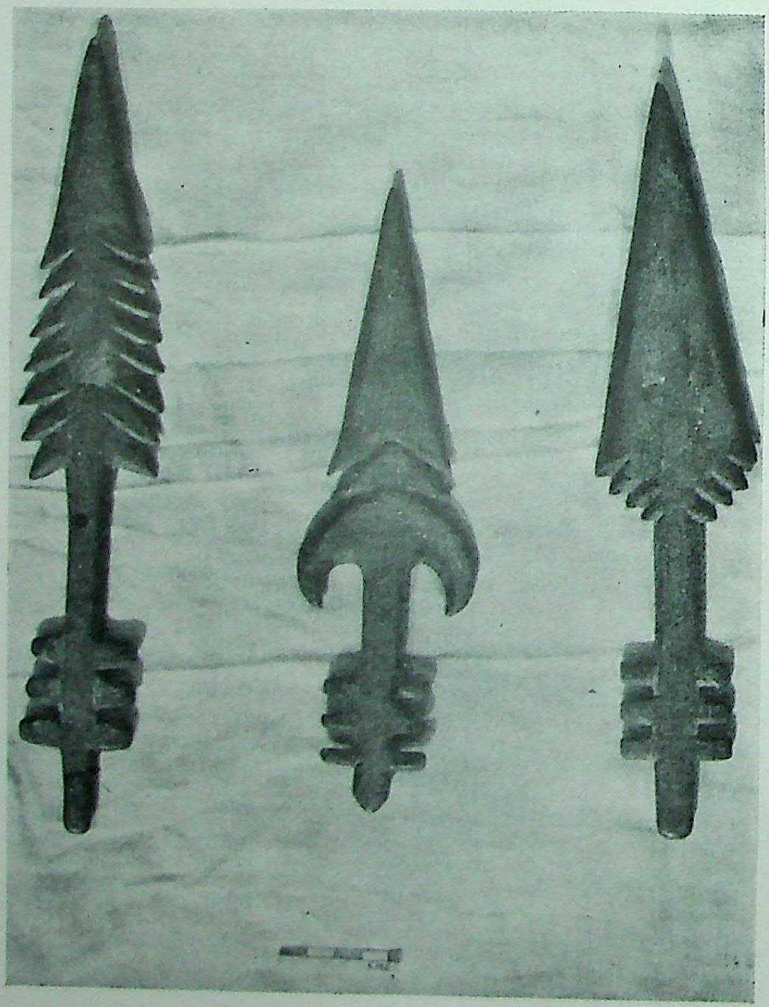

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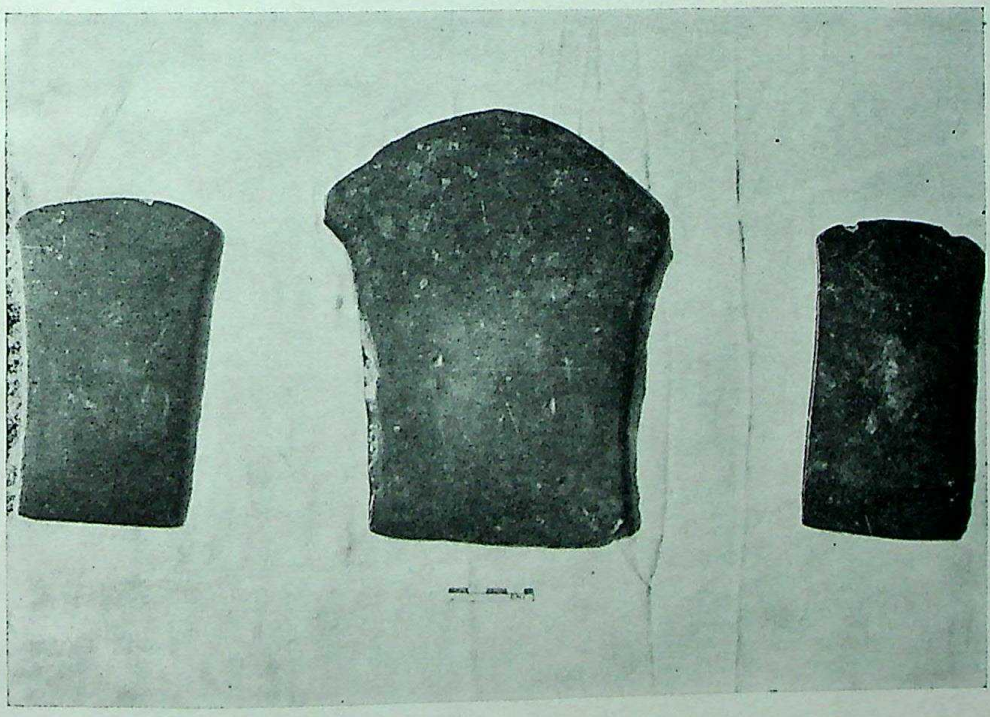

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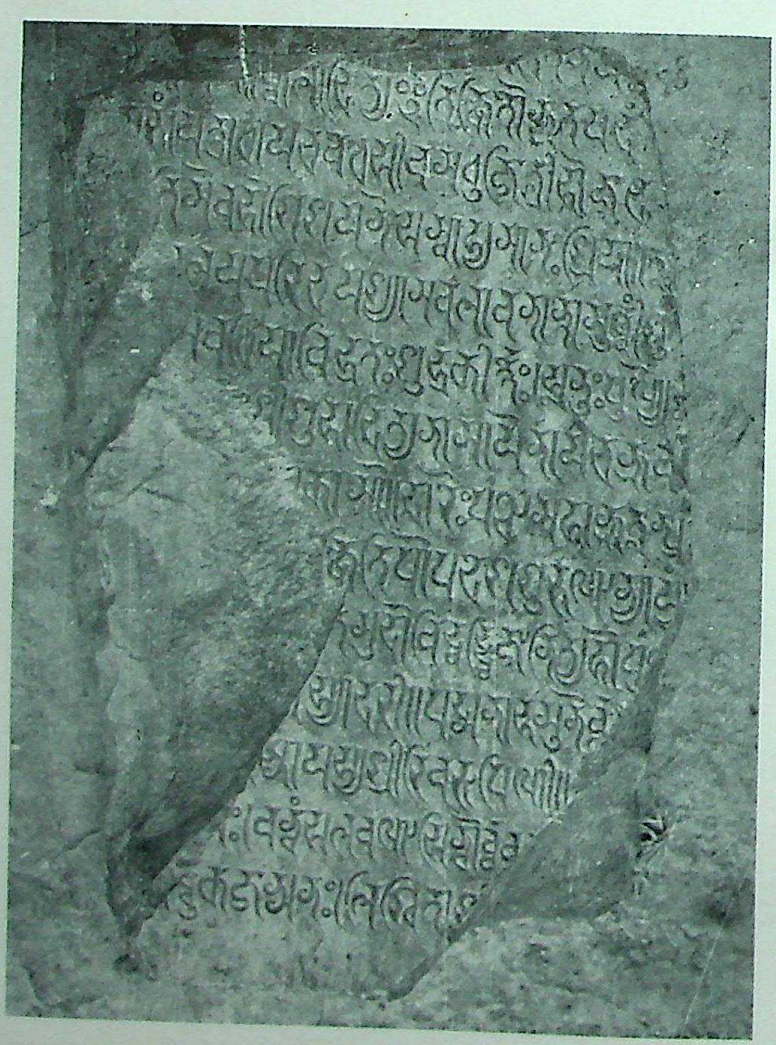

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